



International Bowel
ULTRASOUND GROUP

Perineal US (fistula, abscess, UC)

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Disclosure

I have received:

- Speaker fees from **Janssen, AbbVie, Pfizer, Galapagos, Tillotts, Alfa Sigma**
- Advisory board/consultancy fees from **Janssen, AbbVie, Pfizer, Galapagos**



Agenda

- Transperineal ultrasound
- Transrectal ultrasound



Transperineal Ultrasound



How???

Left lateral position



Probes

- (Micro-) Convex 3,5-6 MHz
- Linear 5-7,5 MHz
- Trans-vaginal 5-7,5 MHz



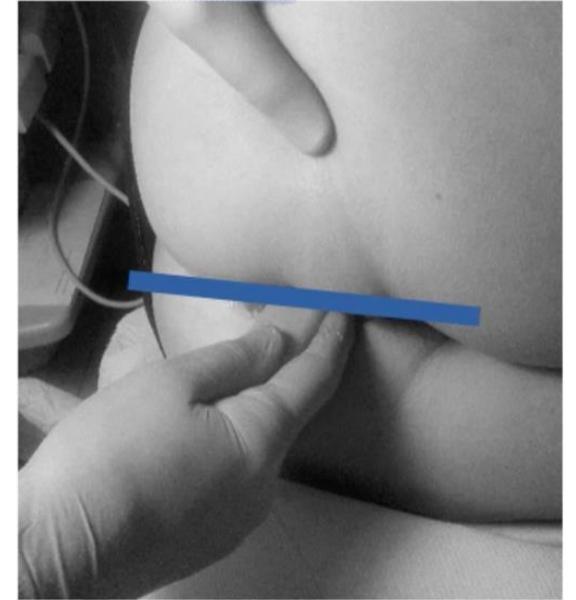
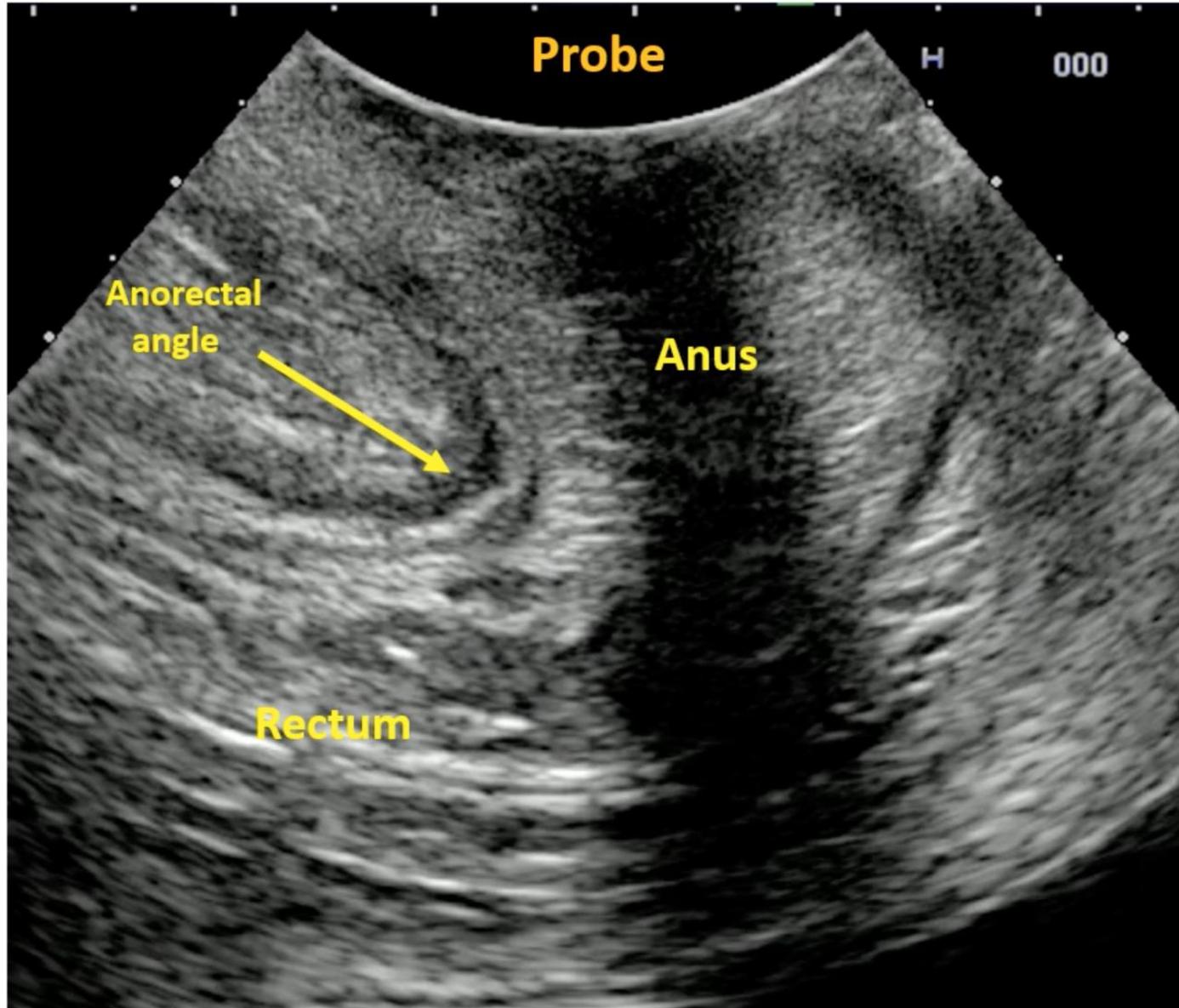


Technique

Start examination

- Anus
- Perianal body
- Vagina/scrotus

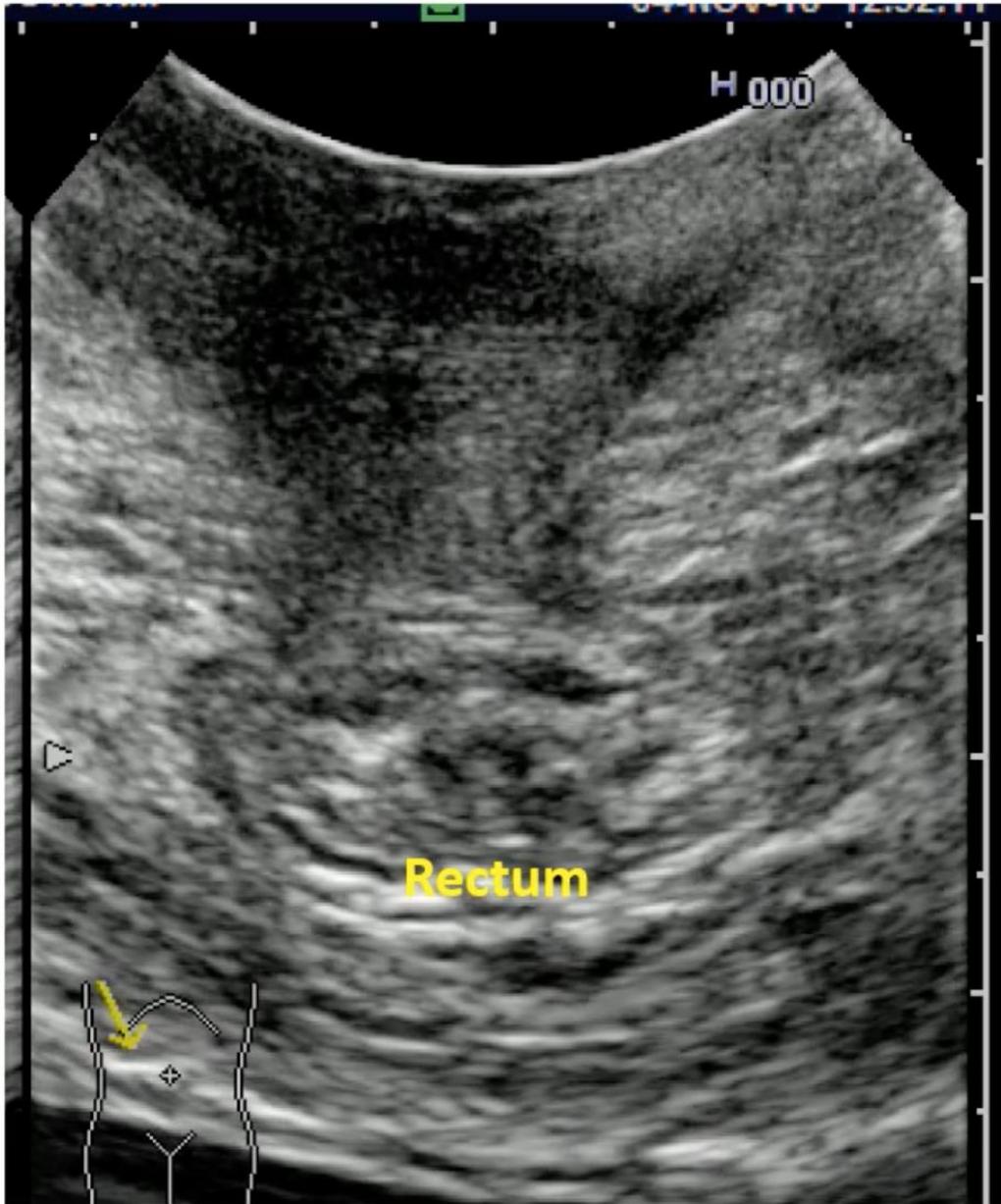




Probe on the anus



Sagittal scan

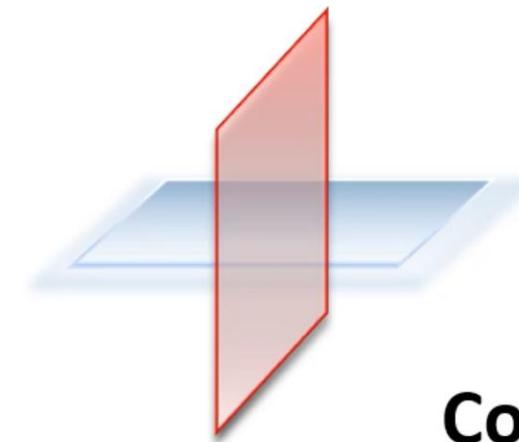
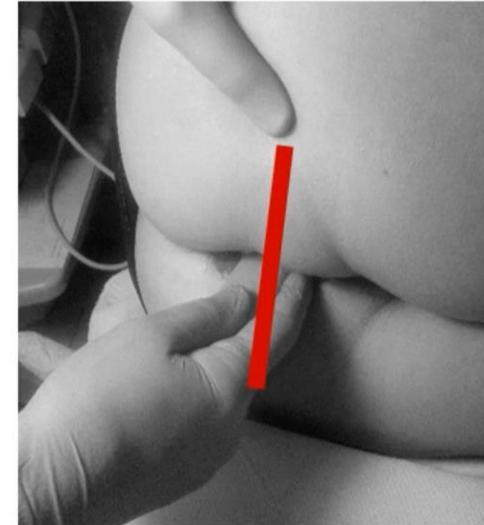
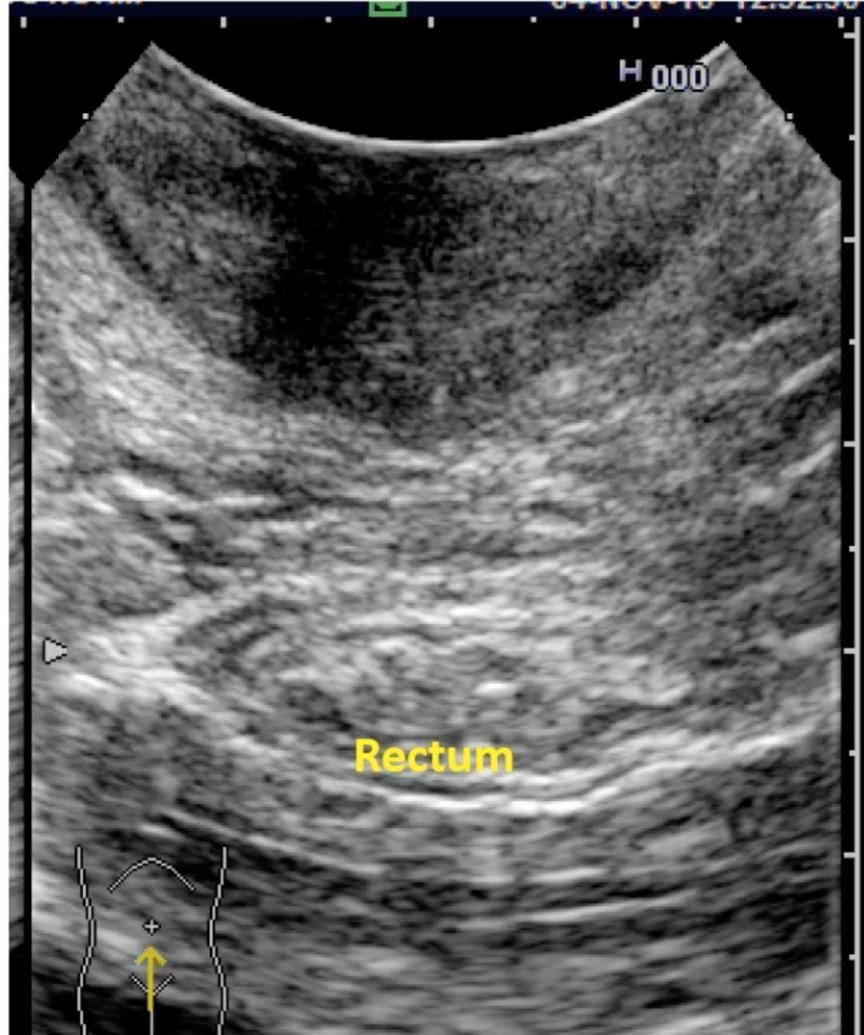
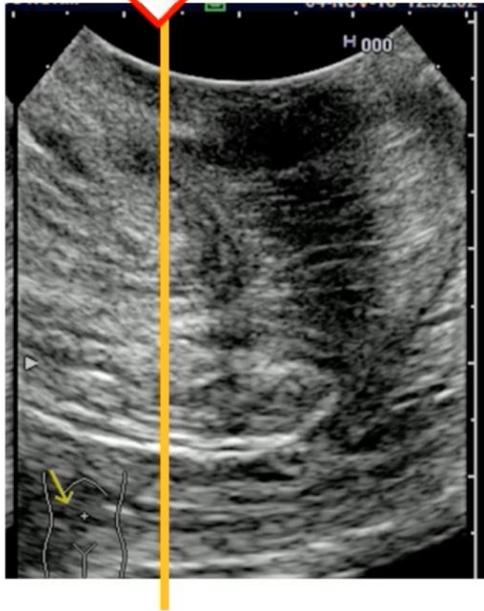
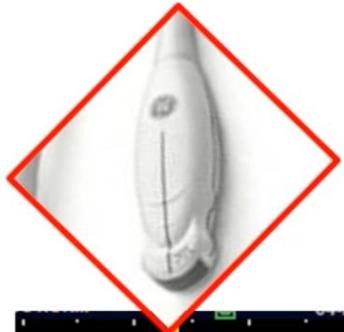
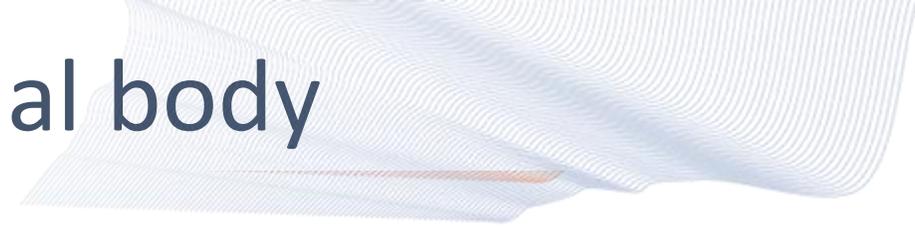


Probe on the perianal body



Coronal scan

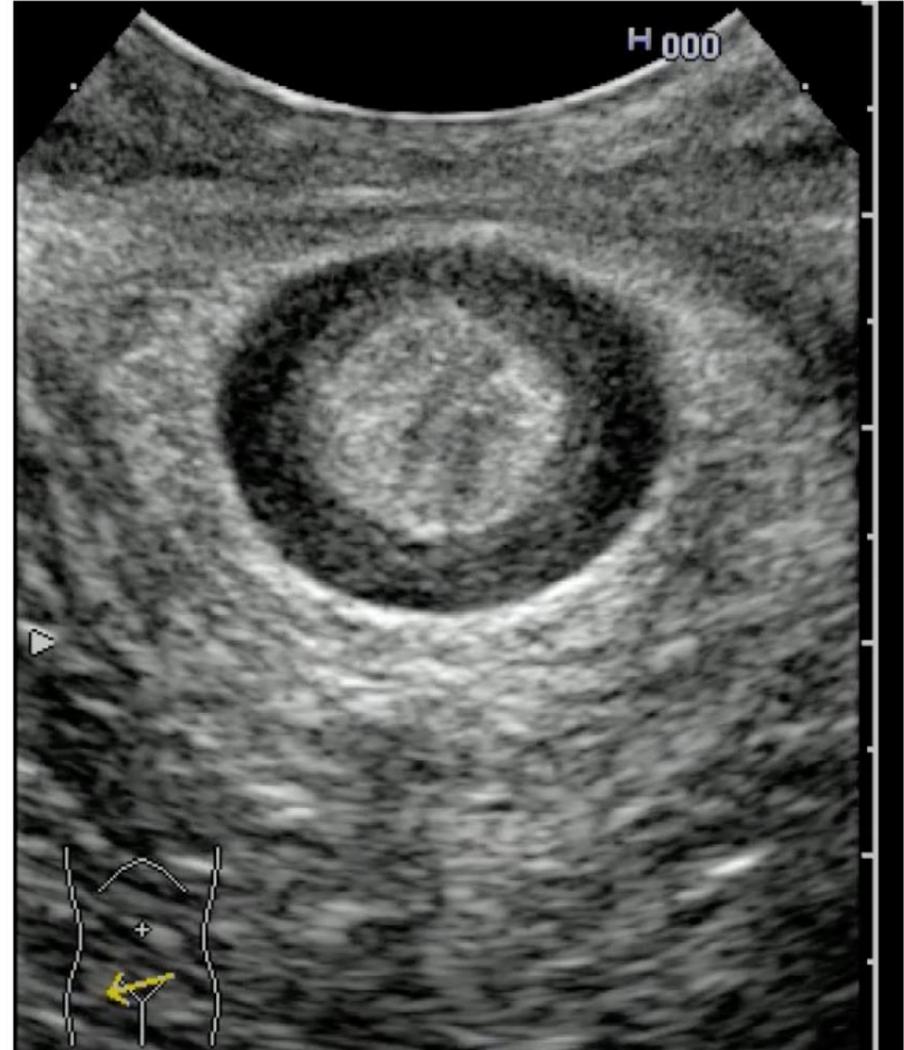
Probe on the perianal body



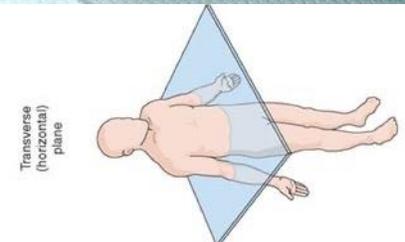
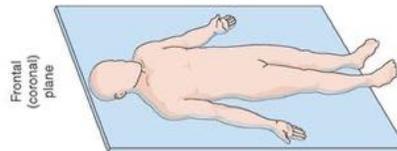
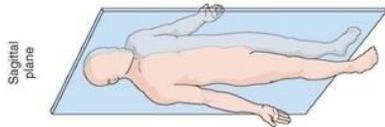
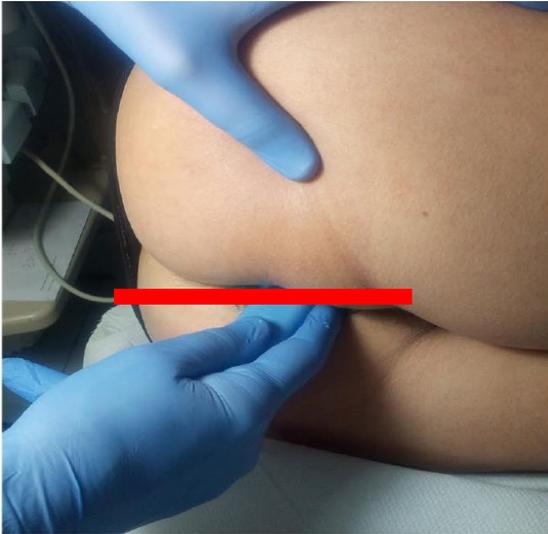
Coronal scan

Trasversal scan

Probe on the base of vagina/scrotus



TPUS for the assessment of the perianal disease

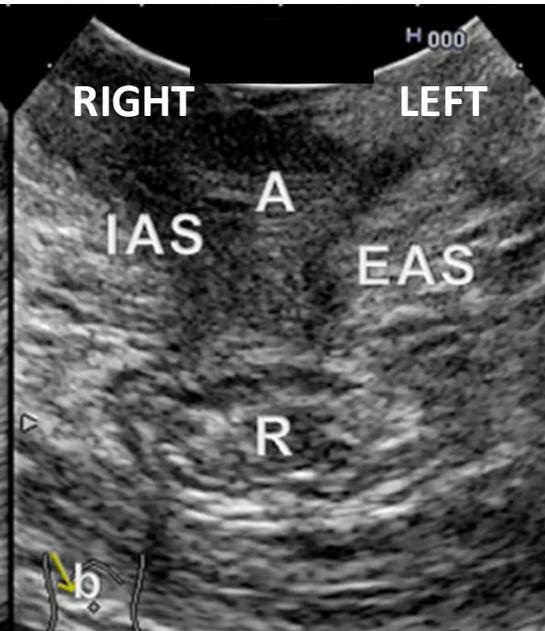


TPUS for the assessment of the perianal disease

Sagittal scan



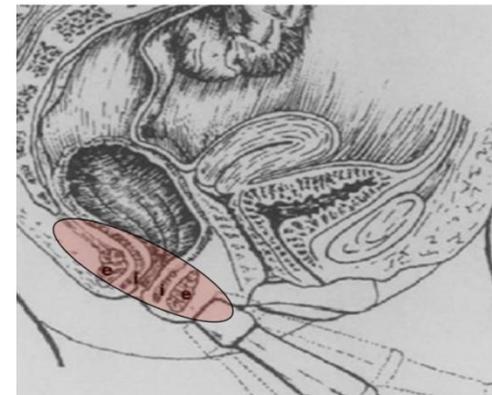
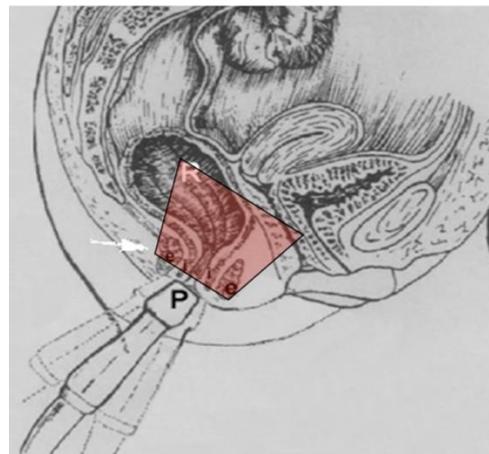
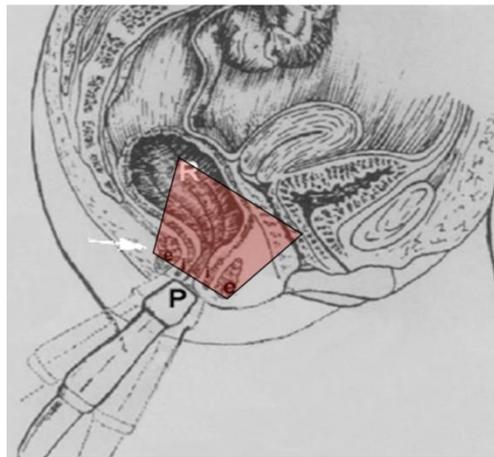
Coronal scan



Trasversal scan



In the transverse scan
Fistulas of the anal canal
are described using a
clock face





When???

Use of Perianal Intestinal Ultrasound

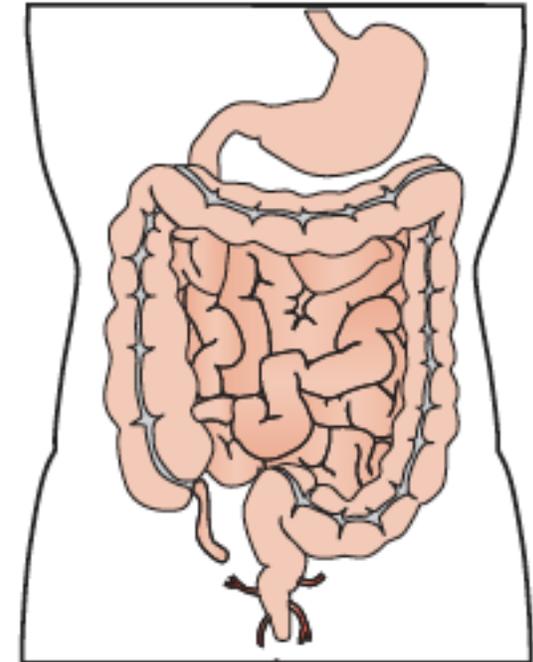
- TPUS in CD
- TPUS in UC
- TPUS in pouch



Crohn's disease

Perianal disease

- Perianal fistulas constitute the majority of fistulizing Crohn's disease
- Cumulative incidence of at least one perianal fistula > 25%
- Recurrent episodes of perianal fistulization occur in approx. 30%



B3p
Perianally penetrating

Accuracy of TPUS & TRUS

Table 3. Accuracy of Transrectal Sonography, Transperineal Sonography, and MRI in Perianal Crohn Disease

Modality	Sensitivity, %	Specificity, %	PPV, %	NPV, %
Fistula				
Transrectal sonography	84.6	81.80	20.0	20.0
Transperineal sonography	100	100	100	100
MRI	84.6	100	100	20.0
Abscess				
Transrectal sonography	92.8	76.4	71.4	100
Transperineal sonography	100	86.6	83.3	100
MRI	58.8	92.8	90.9	65.0
Rectal involvement				
Transrectal sonography	86.3	0	100	25.0
Transperineal sonography	95.4	100	95.4	0
MRI	95.4	0	100	50.0

NPV indicates negative predictive value; and PPV, positive predictive value.

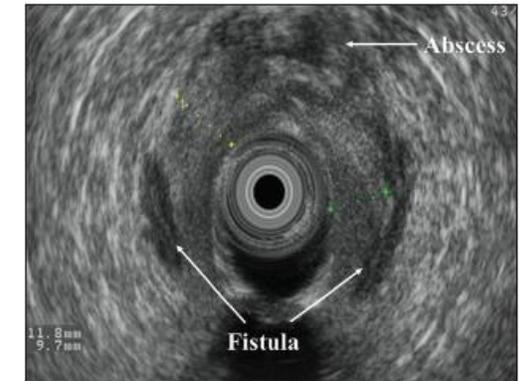
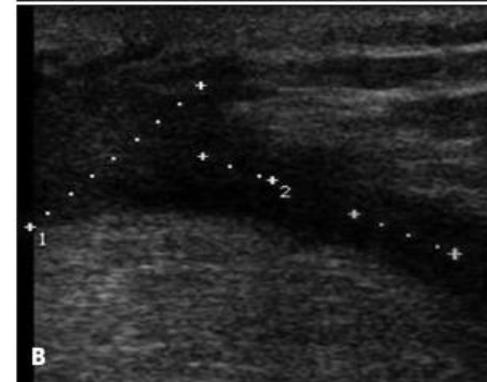
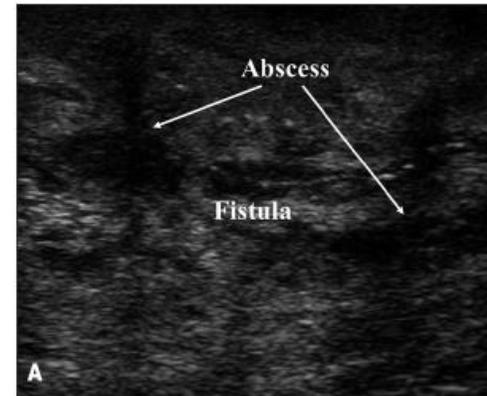
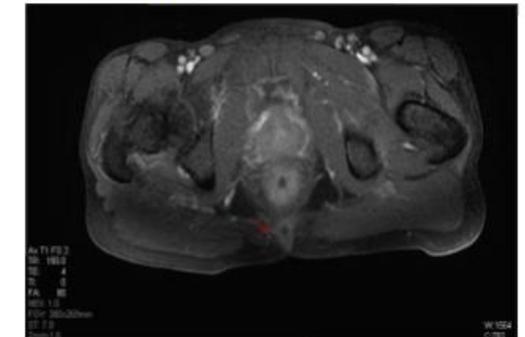


Figure 2. Axial T1-weighted MRI showing rectal wall thickening with a fistula located posteriorly.



Definition in perianal disease

Fistula	Tracts connecting the anus or rectum and the perianal skin or other organs ⁶
Complex fistula	High fistula or with one or more of the following characteristics: extensions, multiple external openings, complicated by an abscess, urogenital involvement or anorectal stricture ²
Sinus	Blind-ending tract without either an external or an internal opening ¹³¹
Abscess [or collection]	US: hypo-anechoic structures [≥ 10 mm], containing echoic fluid and sometimes gas bubbles, with posterior echo enhancement and internal echoes ¹²⁷
Internal opening	Defect in the internal anal sphincter and the subepithelial space ^{134,135}
External opening	Visible external opening to the skin surface ^{6,136}
Extension	An additional secondary tract or branch of a fistula, which may be blind ending or connect to other organs or skin ⁶



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Distinction Between Simple and Complex Fistula (AGA Classification)

Characteristic	Simple Fistula	Complex Fistula
Anatomic position	Low superficial, inter-, or trans-sphincteric	High inter-, trans-, extra-, and supra-sphincteric
External orifice	Single	May be multiple
Fluctuation	Never	May be associated
Rectovaginal fistula	Never	May be associated
Stricture	Never	May be associated

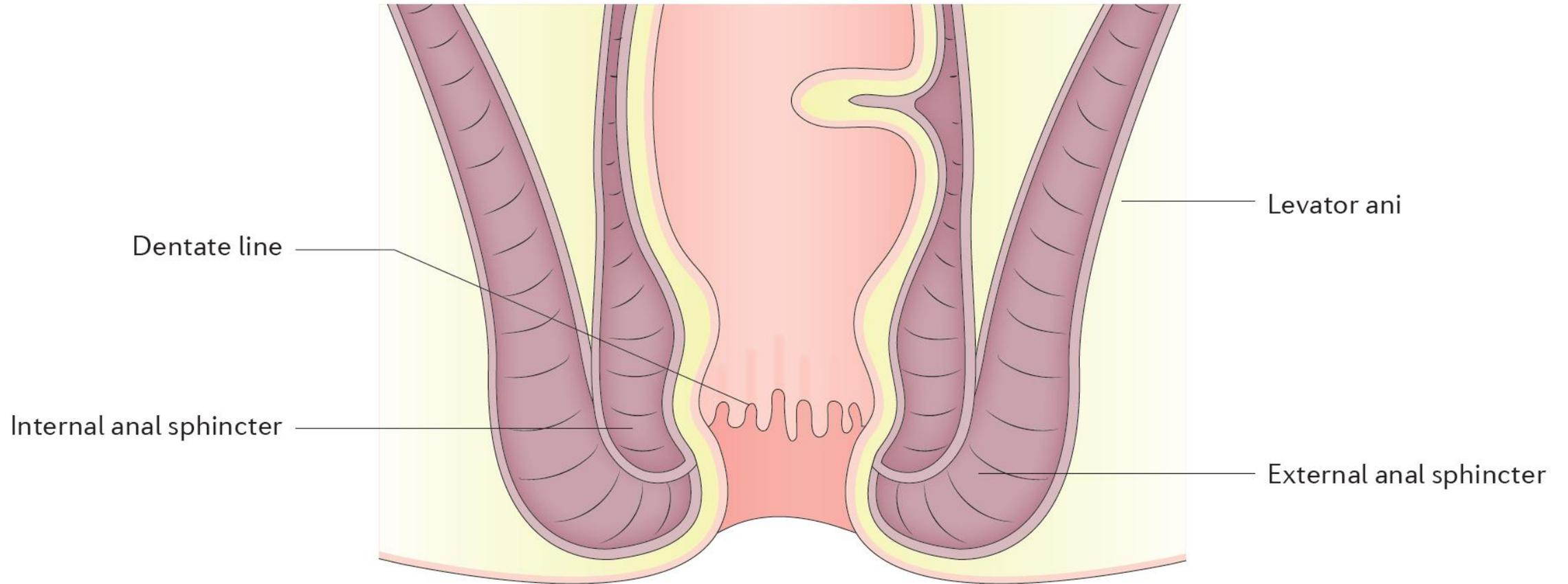
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Anatomy



Classification of perianal fistulas: Parks' classification

Parks classification

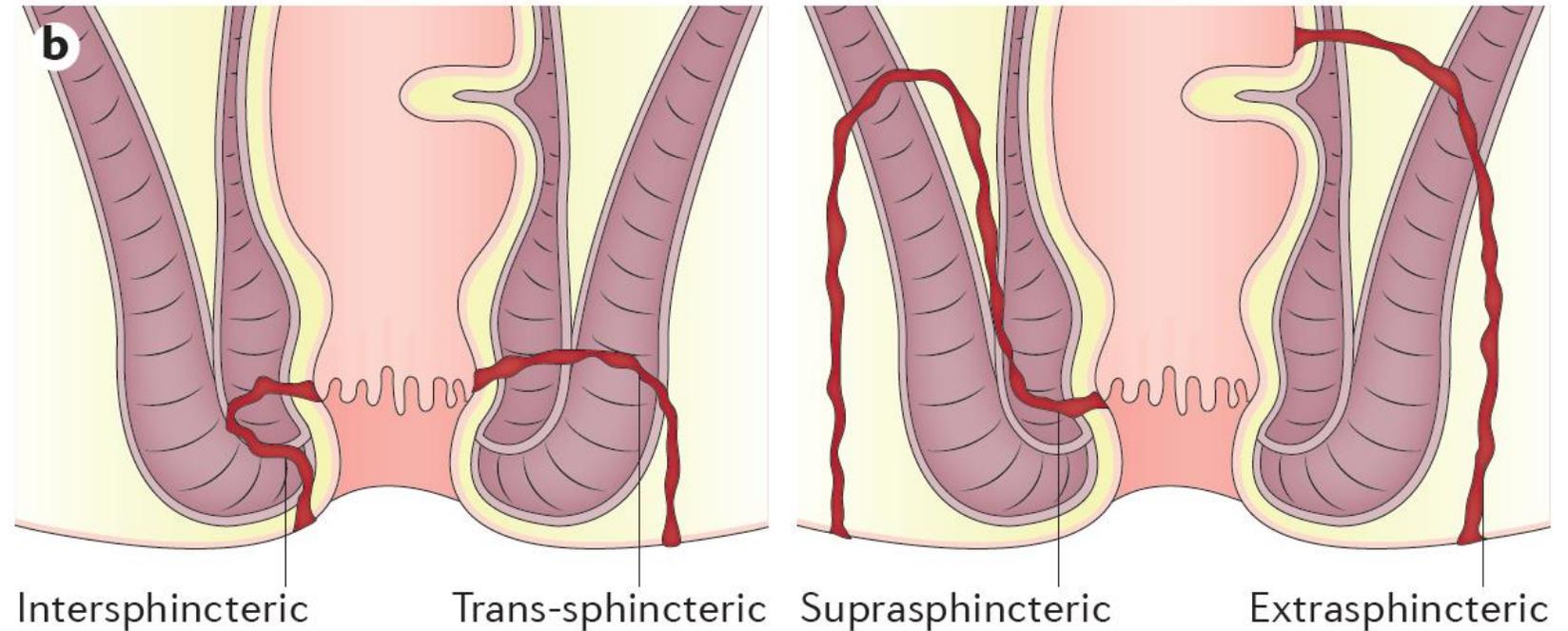
Superficial Superficial fistula without crossing any sphincter or muscular structure

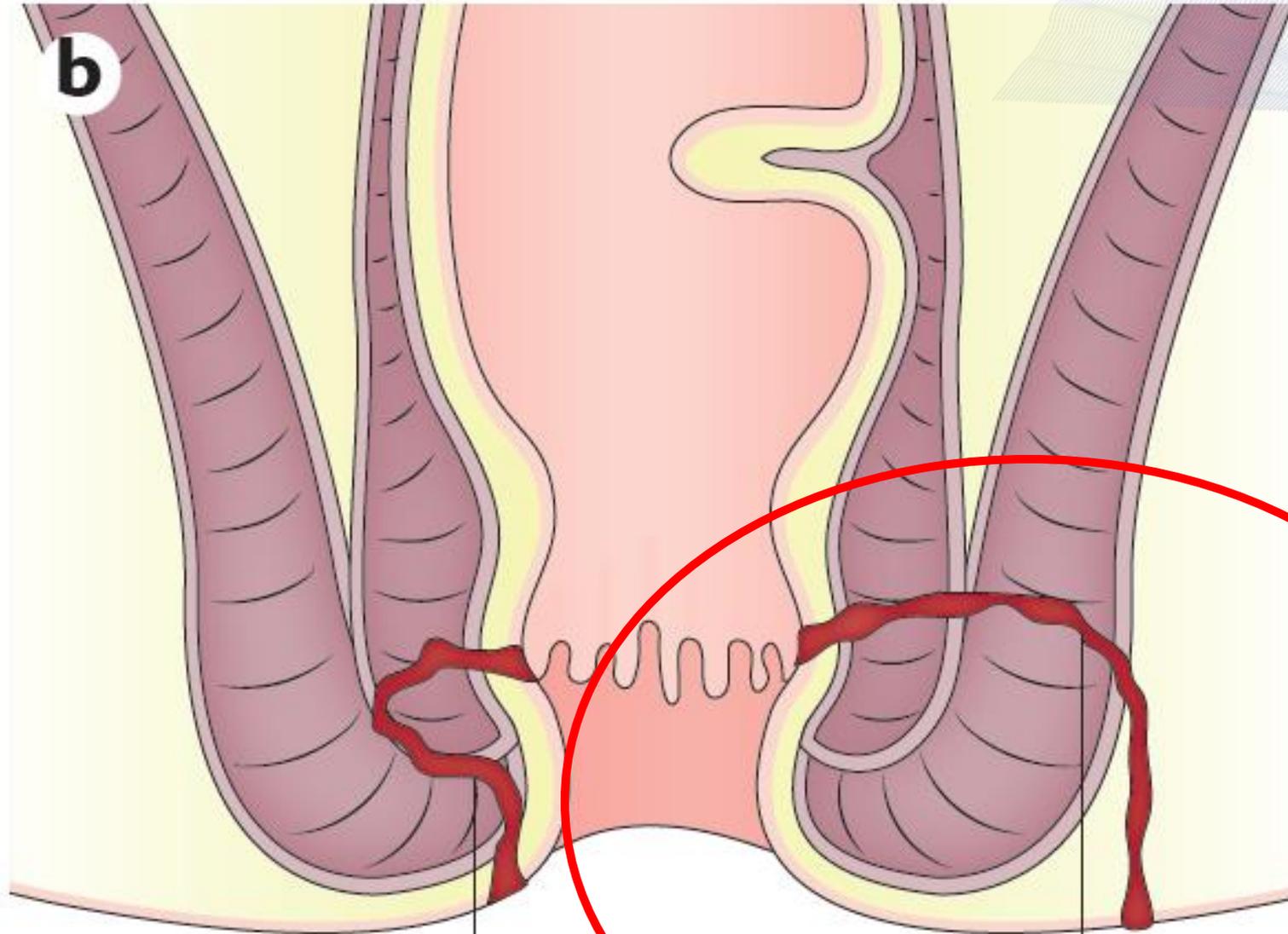
Intersphincteric Fistula tract between the internal anal sphincter and external anal sphincter, in the intersphincteric space

Trans-sphincteric Fistula tract crosses the external anal sphincter

Suprasphincteric Fistula tract penetrates the intersphincteric space and continues over the top of the puborectalis and penetrates the levator muscle before reaching the skin

Extrasphincteric Fistula tract outside the external anal sphincter and penetrating the levator muscle





b

Fistula crossing the
internal and external
sphinter

Intersphincteric

Trans-sphincteric



inter
ULTR

MI 0.85 TIS < 0.4 AP: 100%

43 FPS

Transverse scan



C42
HdT-5.0P R:7.00 BG:73 BD:89

Transphincteric fistula

ANSE Micro.



Transphincteric fistula

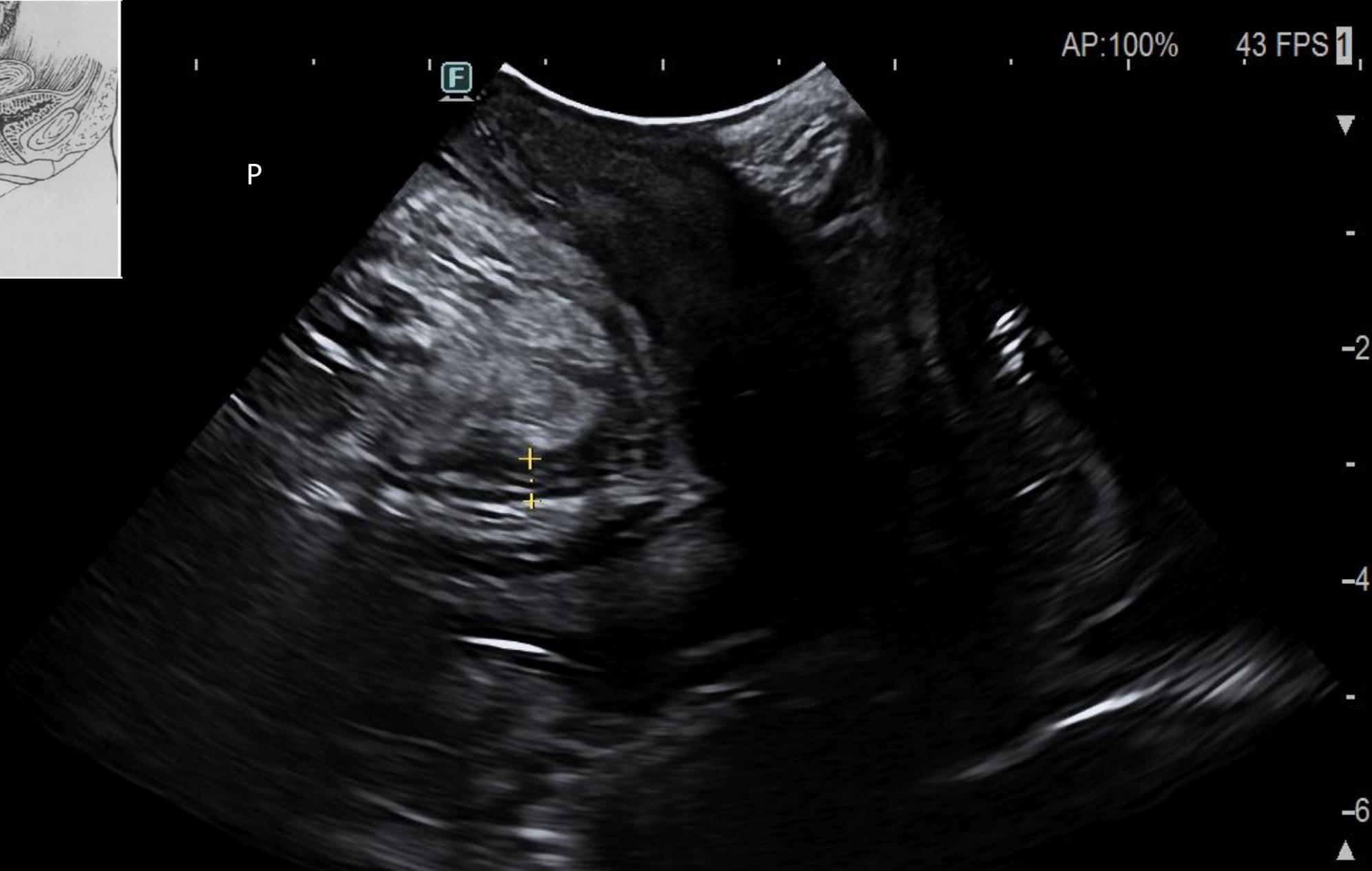
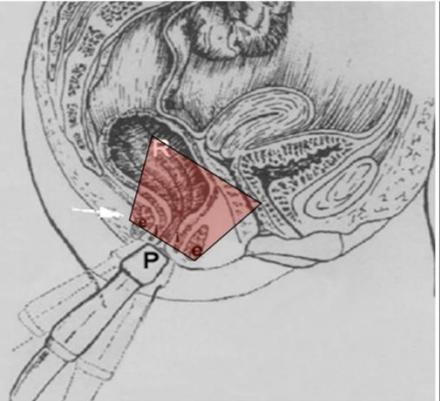


C42 Dist: 7.0mm
HdT-5.0P R:7.00 BG:77 BD:89
0.5k/4.00MHz CG:49



C42 Dist: 8.4mm
HdT-5.0P R:7.00 BG:77 BD:89

ANSE Micro.
1946/1947

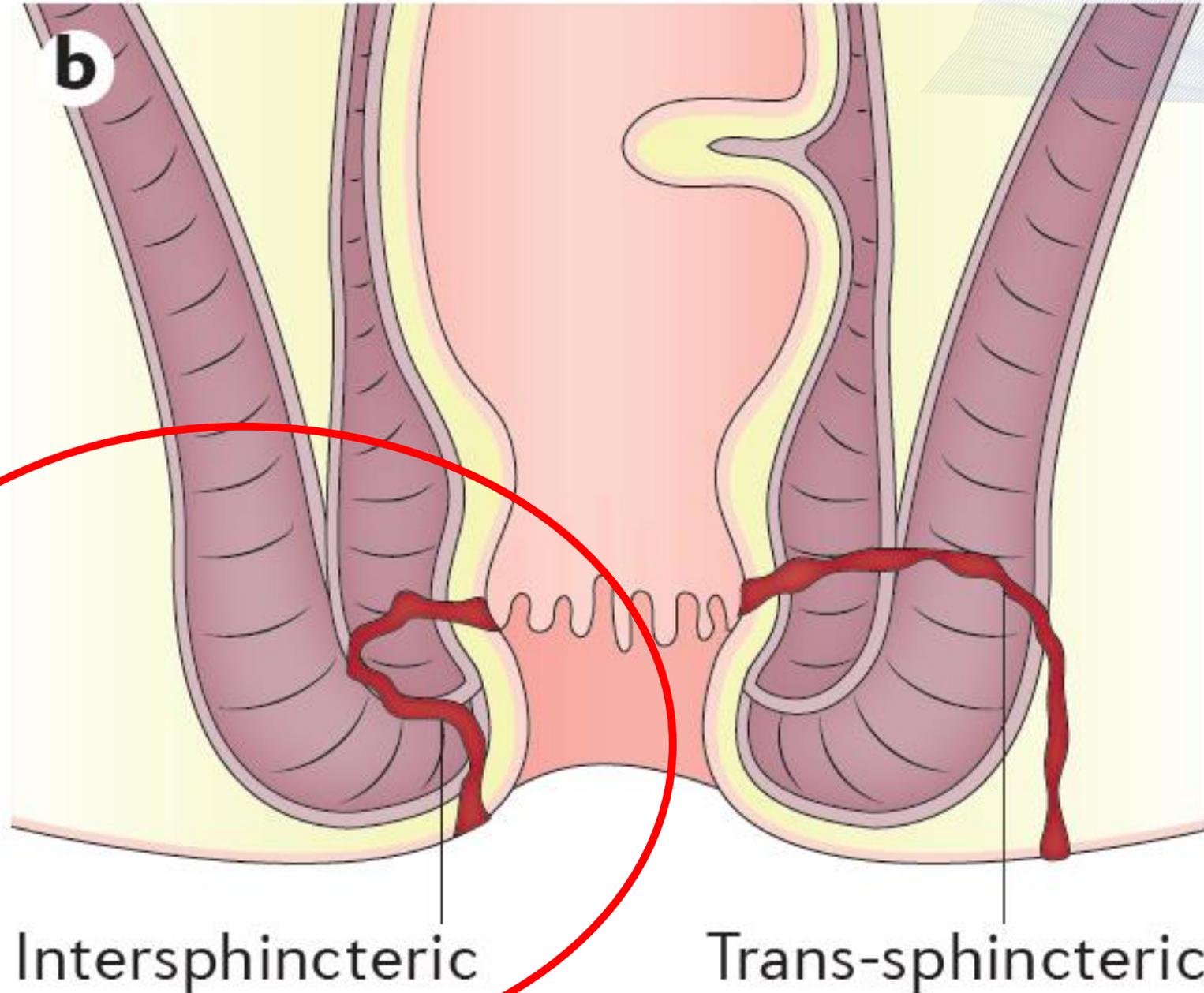


C42
HdT-5.0P

Dist: 3.6mm
R:7.00 BG:73 BD:89

ANSE Micro.
613/614

Fistula between
the anal sphincter
muscle





internotio:
ULTRASOU

MI 1.17 TIS < 0.4 AP: 100% 43 FPS 2



C42
HdT-5.0P R:4.00 BG:74 BD:89

ANSE Micro.

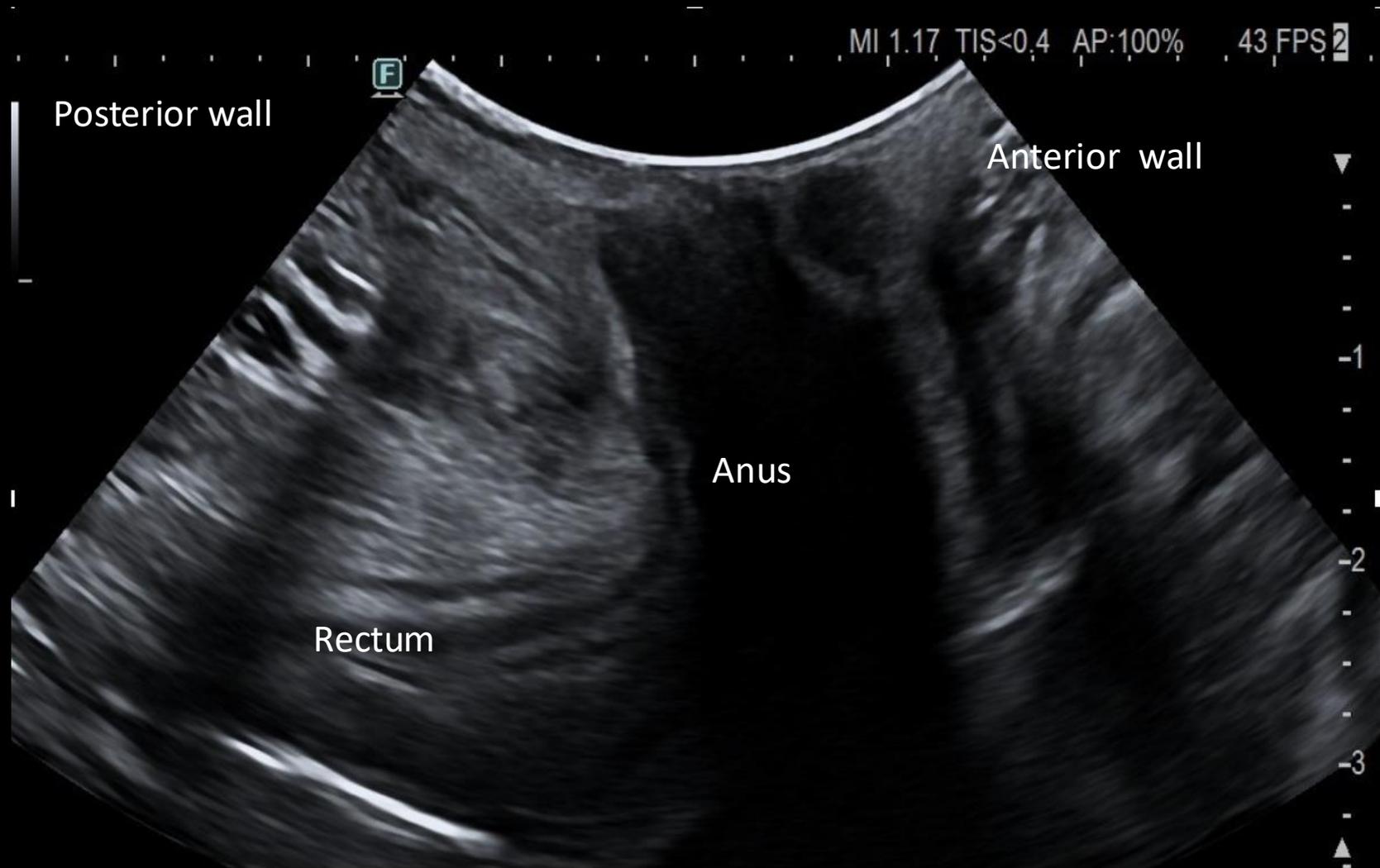
Intersphincteric fistula





Intersphincteric fistula

Sagittal scan

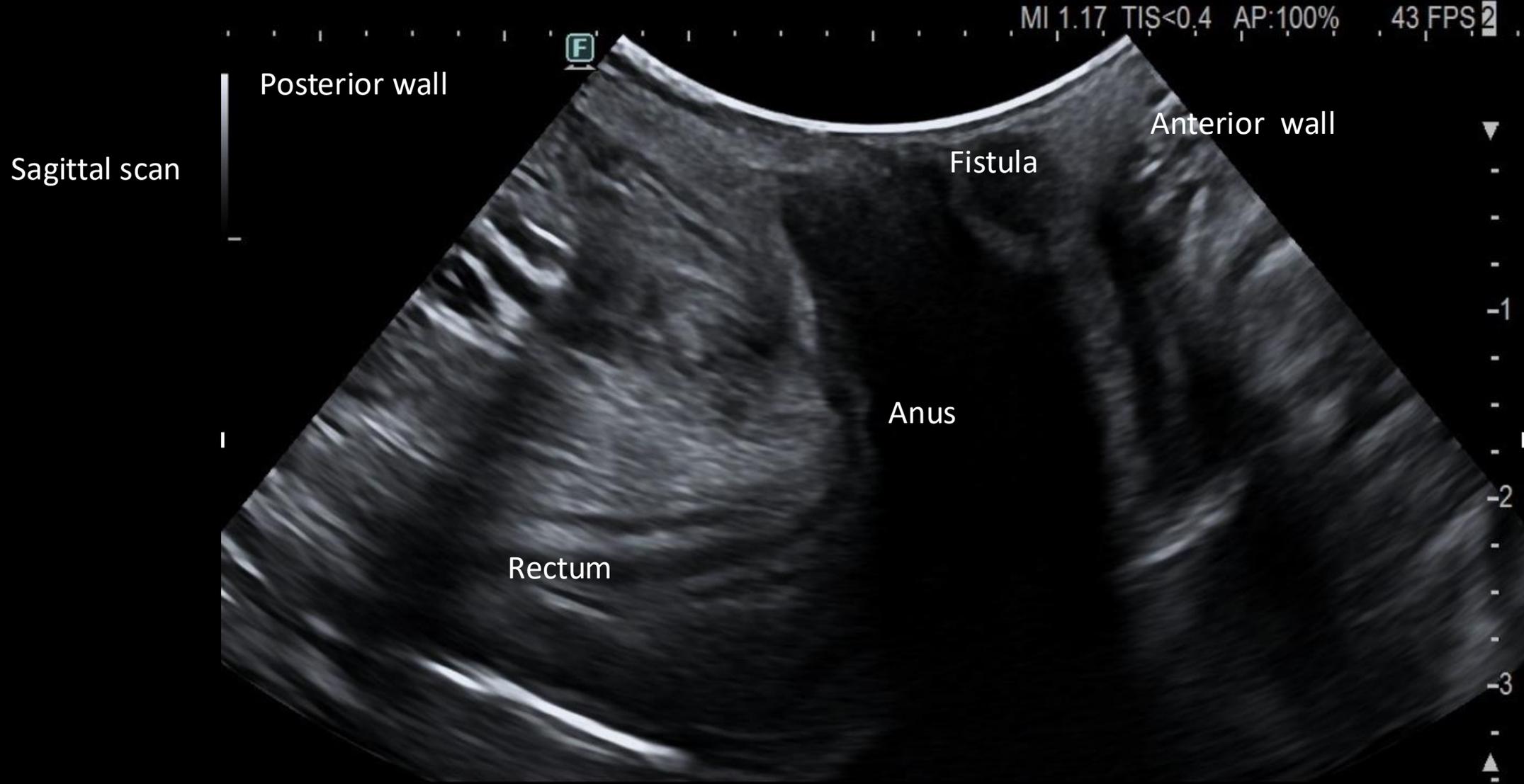


C42
HdT-5.0P R:4.00 BG:74 BD:89

ANSE Micro.



Intersphincteric fistula





Intersphincteric fistula

MI 1.17 TIS < 0.4 AP: 100% 43 FPS 1

Coronal scan



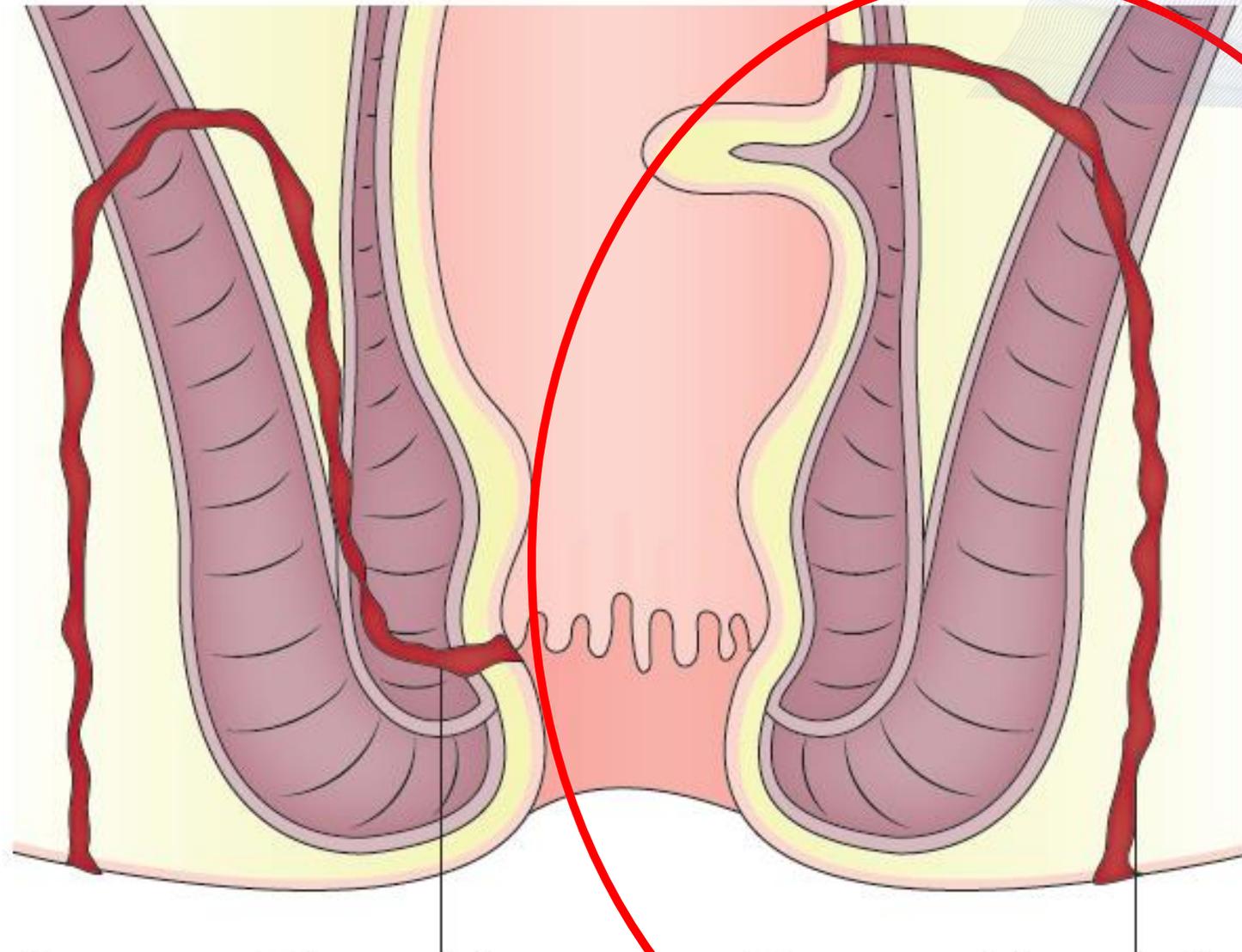
C42
HdT-5.0P R:4.00 BG:74 BD:89

ANSE Micro.



Intersphincteric fistula





Suprasphincteric

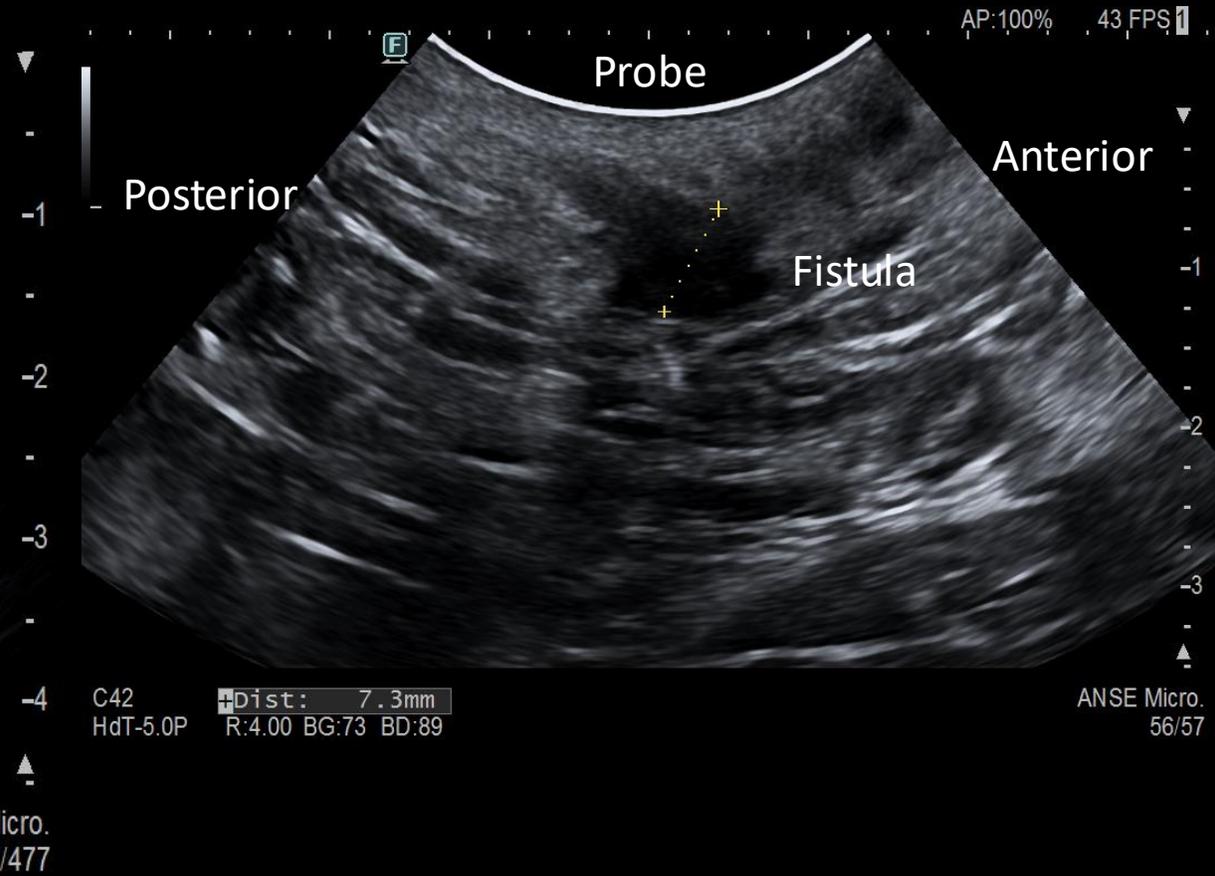
Extrasphincteric



Extrasphincteric fistula



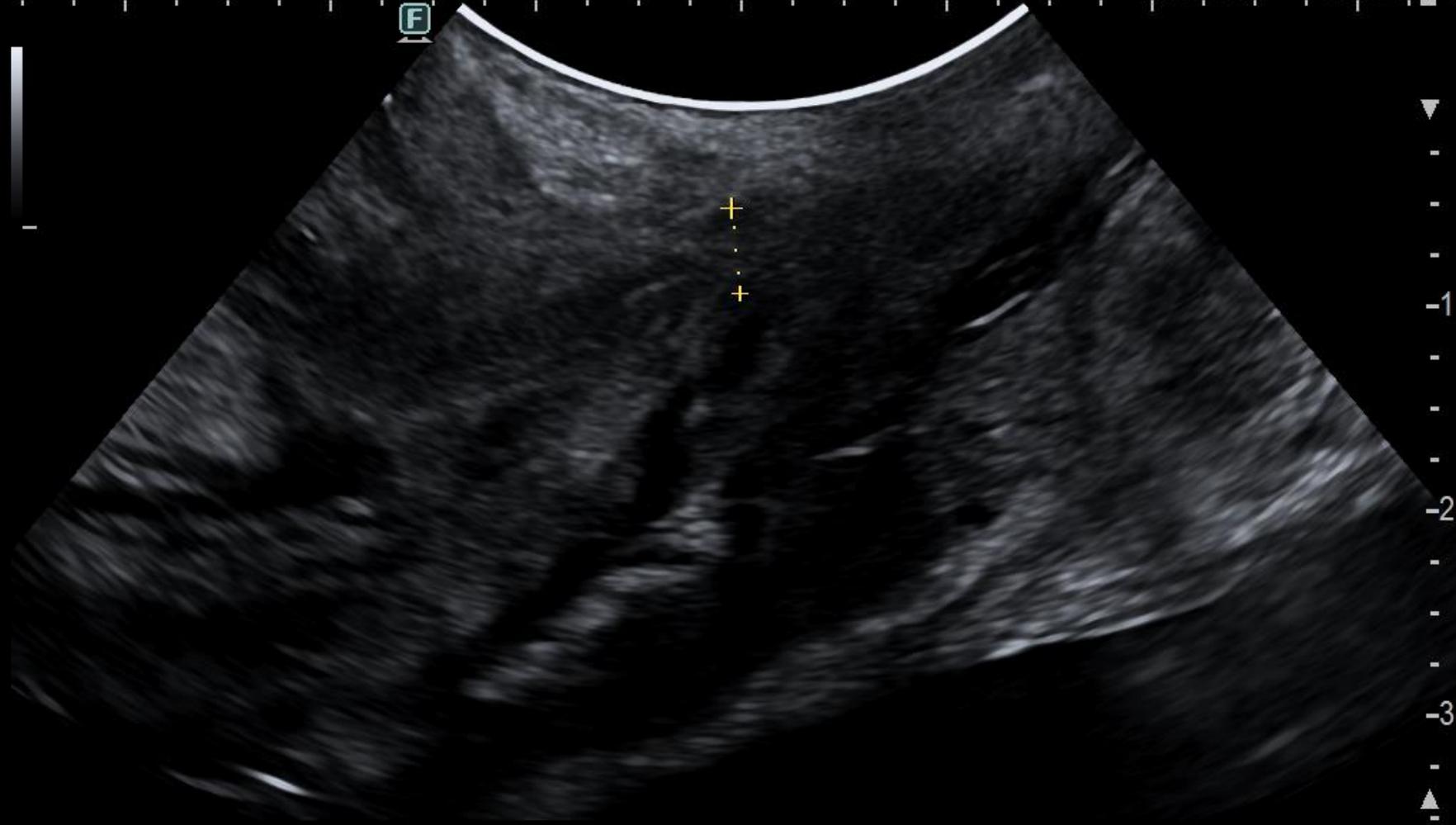
Trasversal scan



Sagittal scan



AP:100% 43 FPS 1



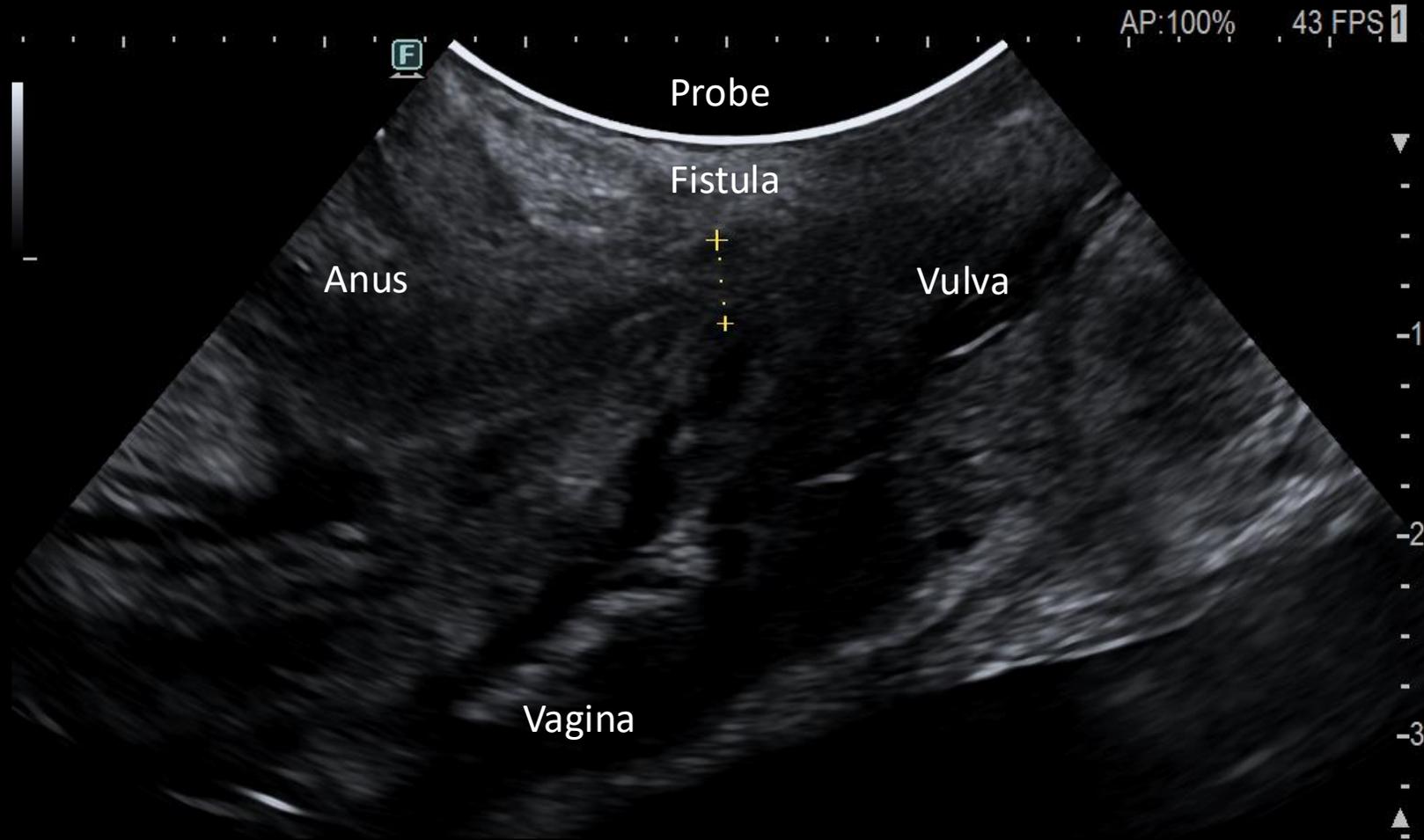
Sagittal scan

Ano-vulvar
fistula

C42
HdT-5.0P

Dist: 4.2mm
R:4.00 BG:73 BD:89

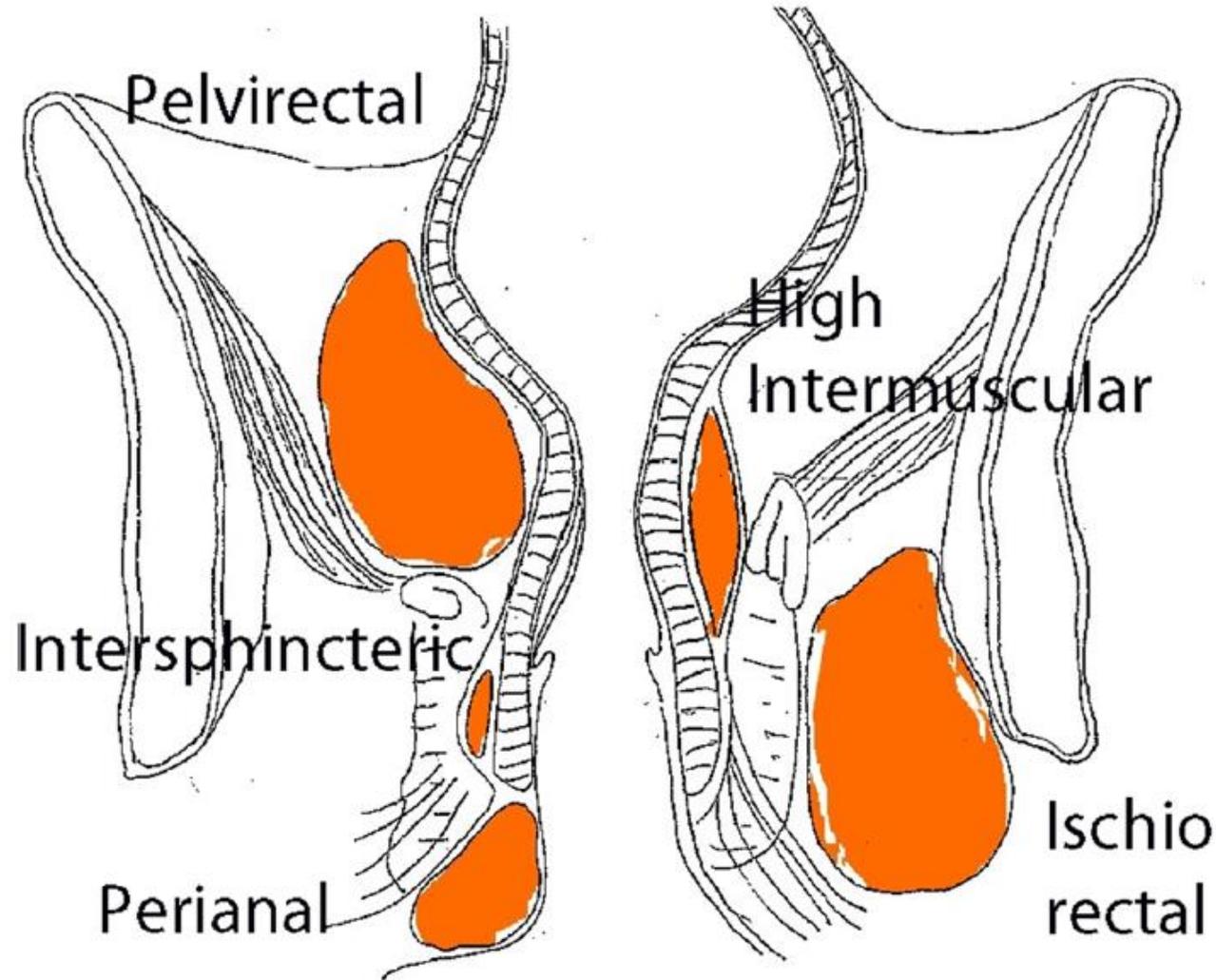
ANSE Micro.
174/175



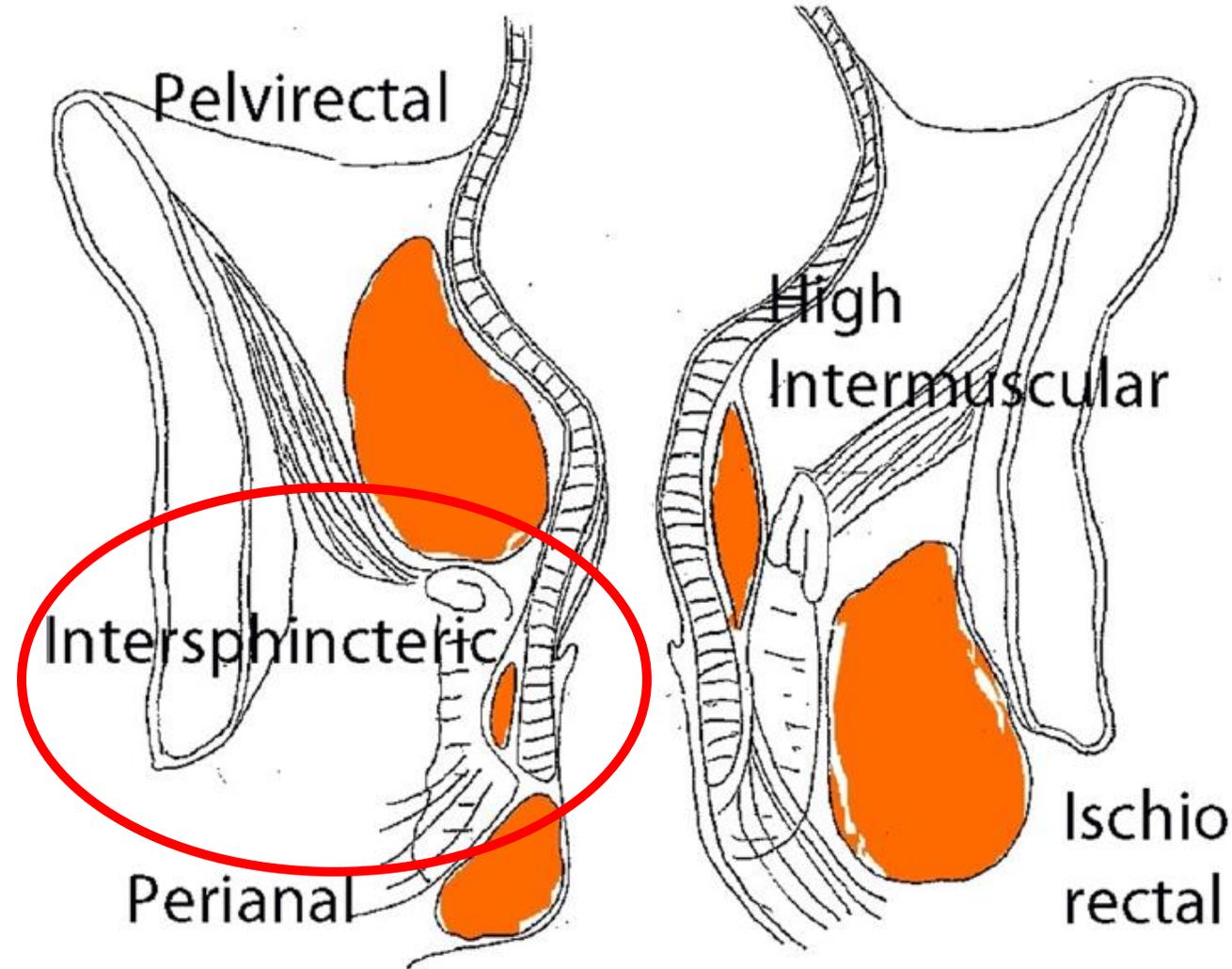
Sagittal scan

Ano-vulvar
fistula

Classification of perianal abscesses



Classification of perianal abscesses

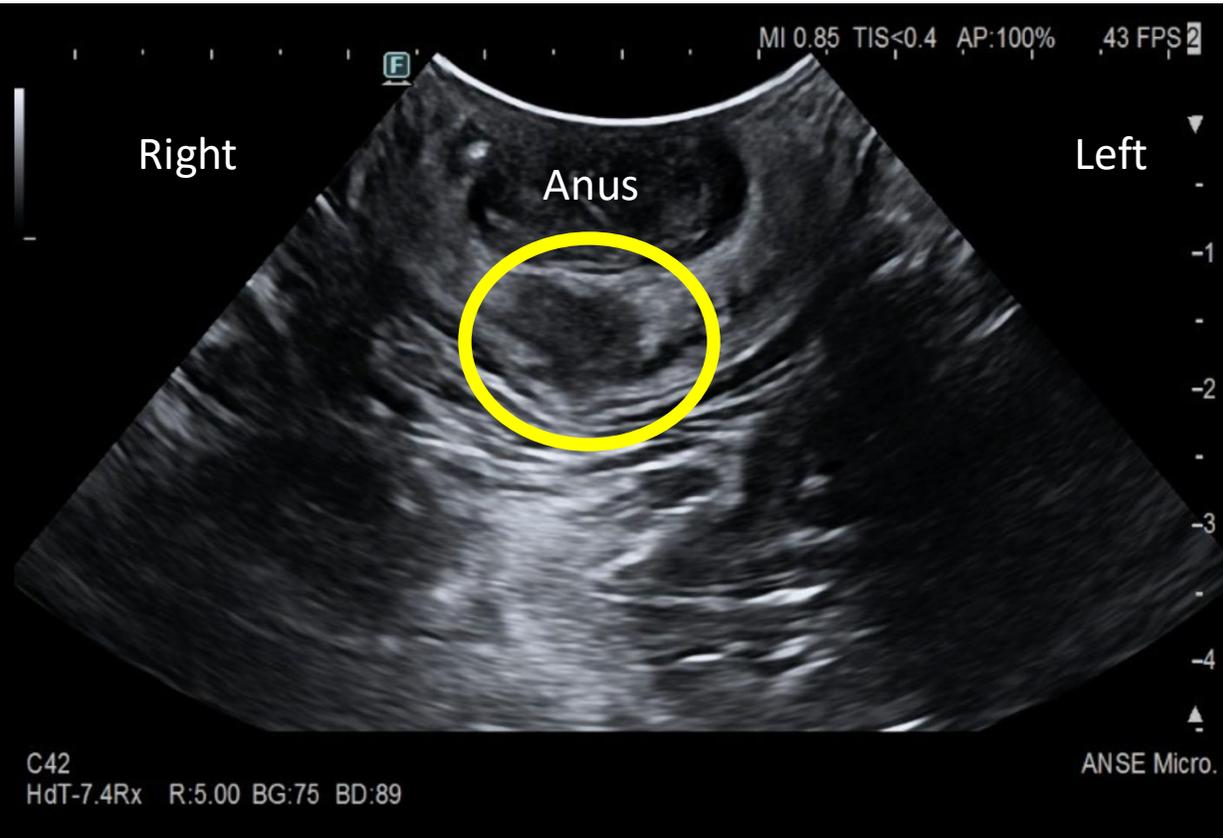


Intersphincteric abscess

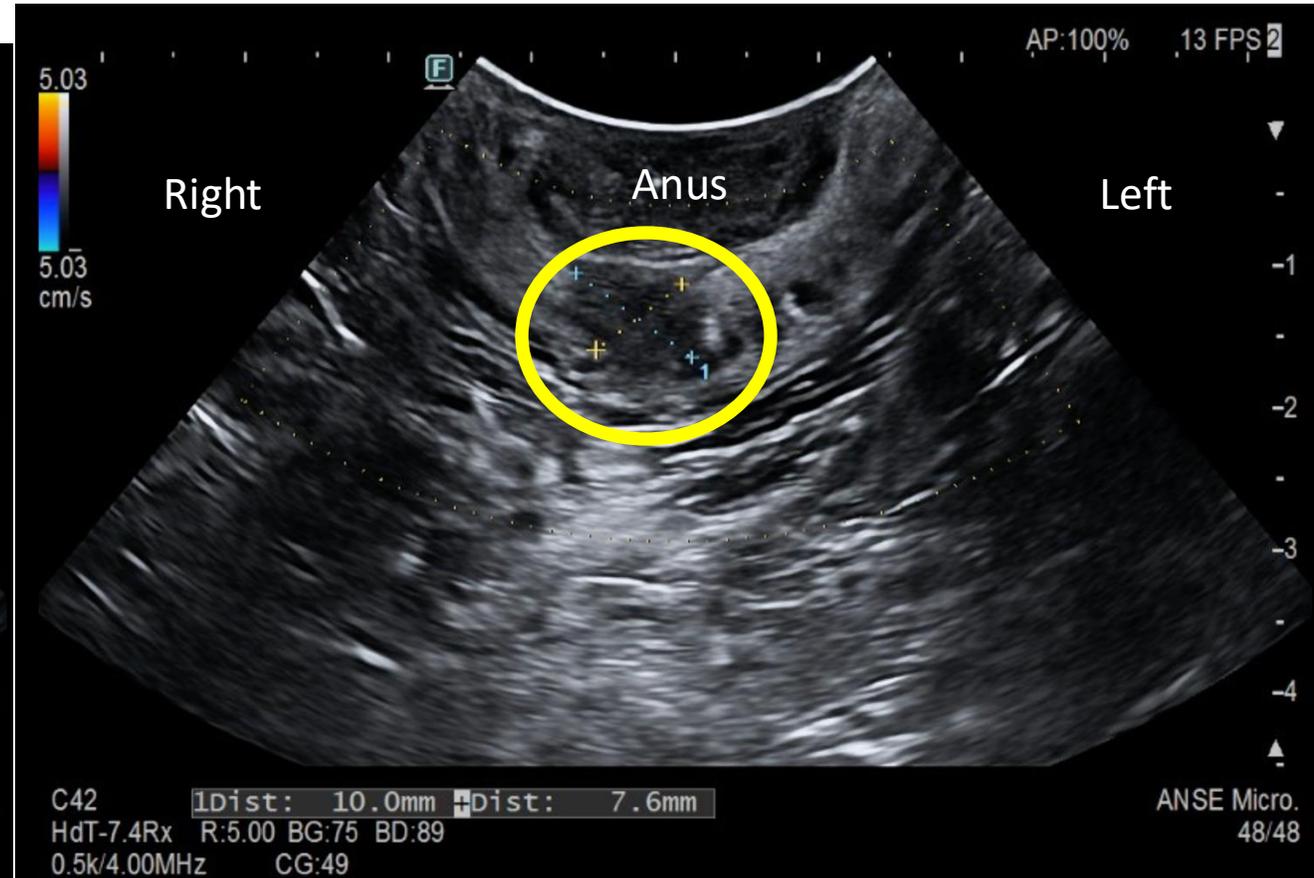
Transverse scan

posterior intersphincteric hypoechoic lesion at 6 o'clock, with no vascularization on color Doppler.

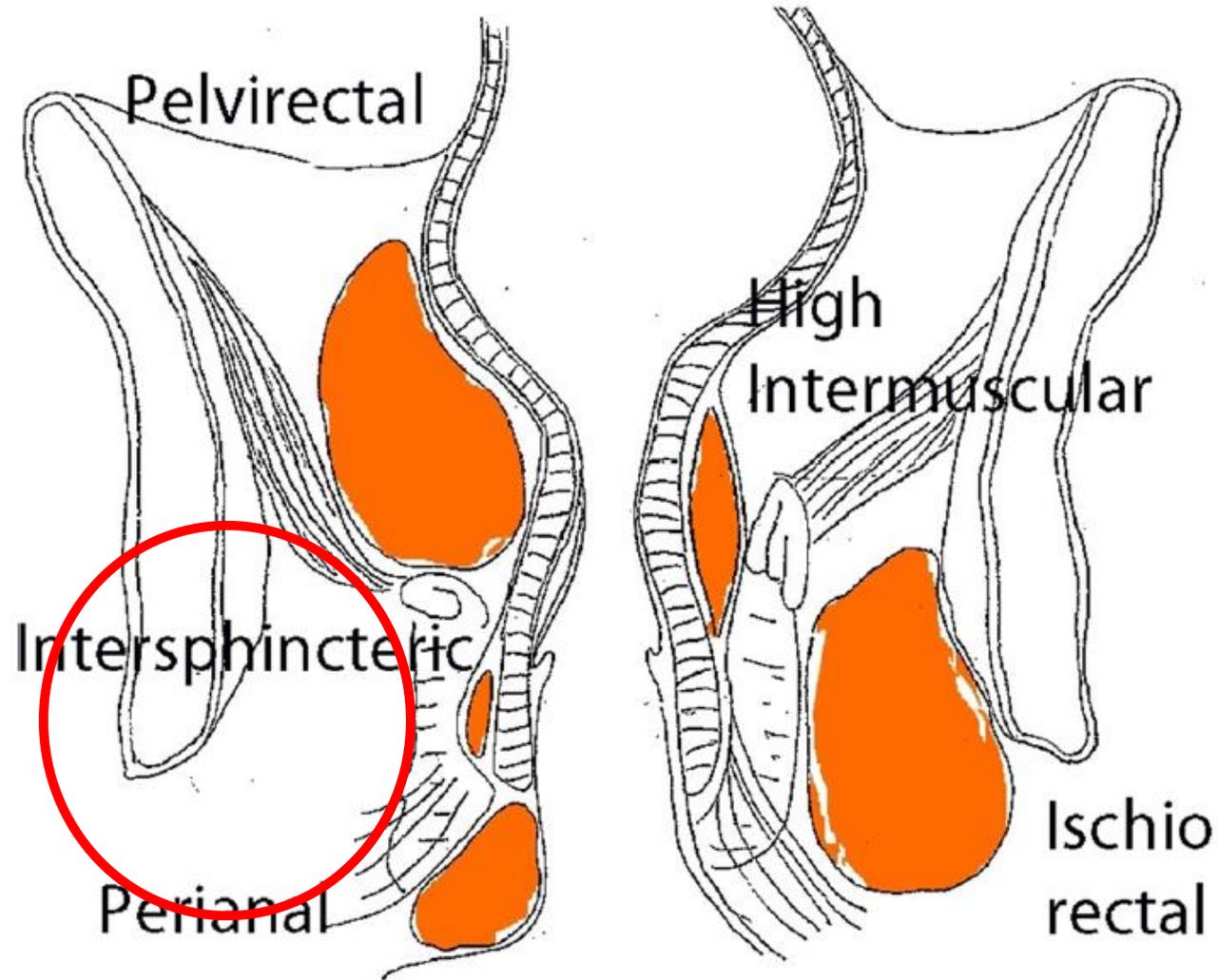
Probe



Probe

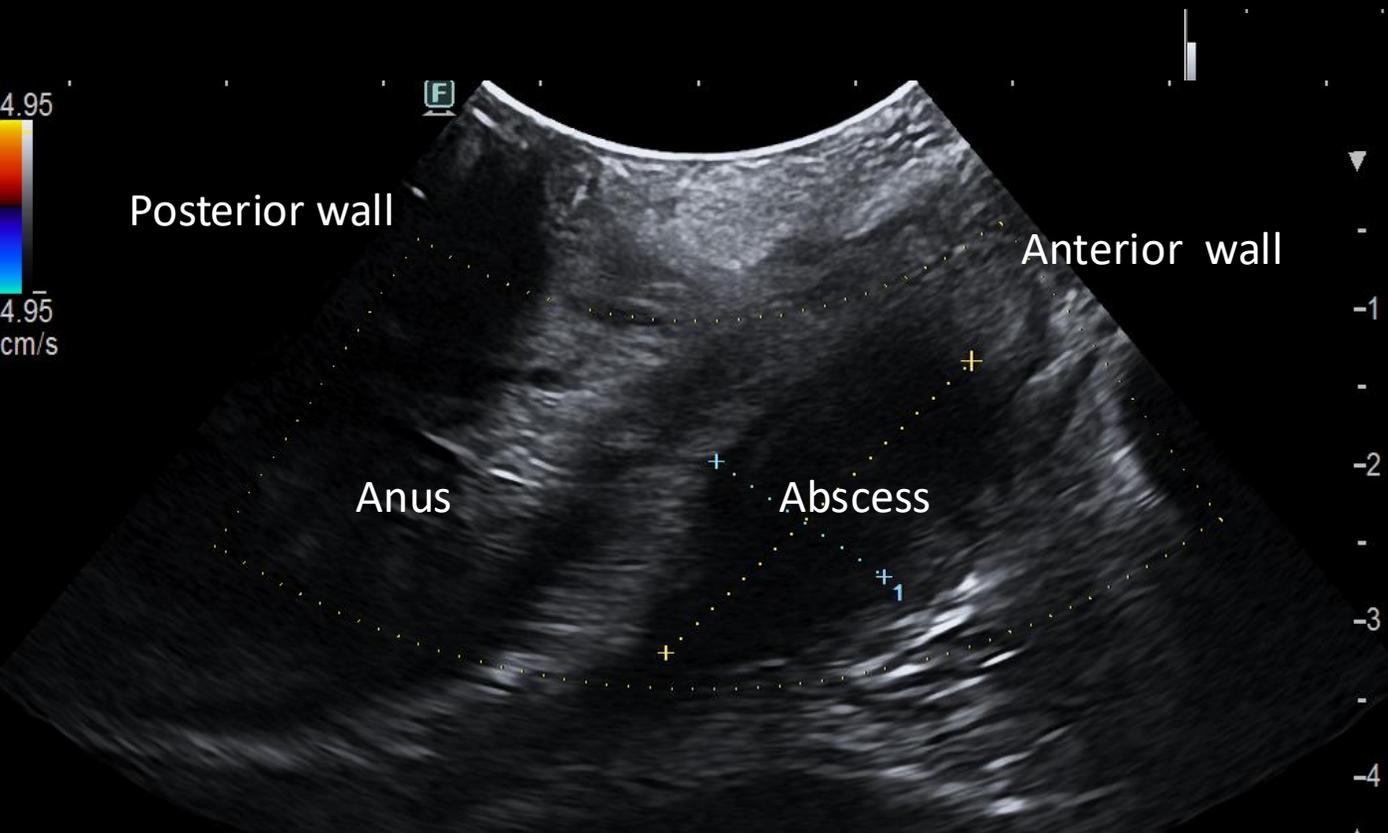


Classification of perianal abscesses

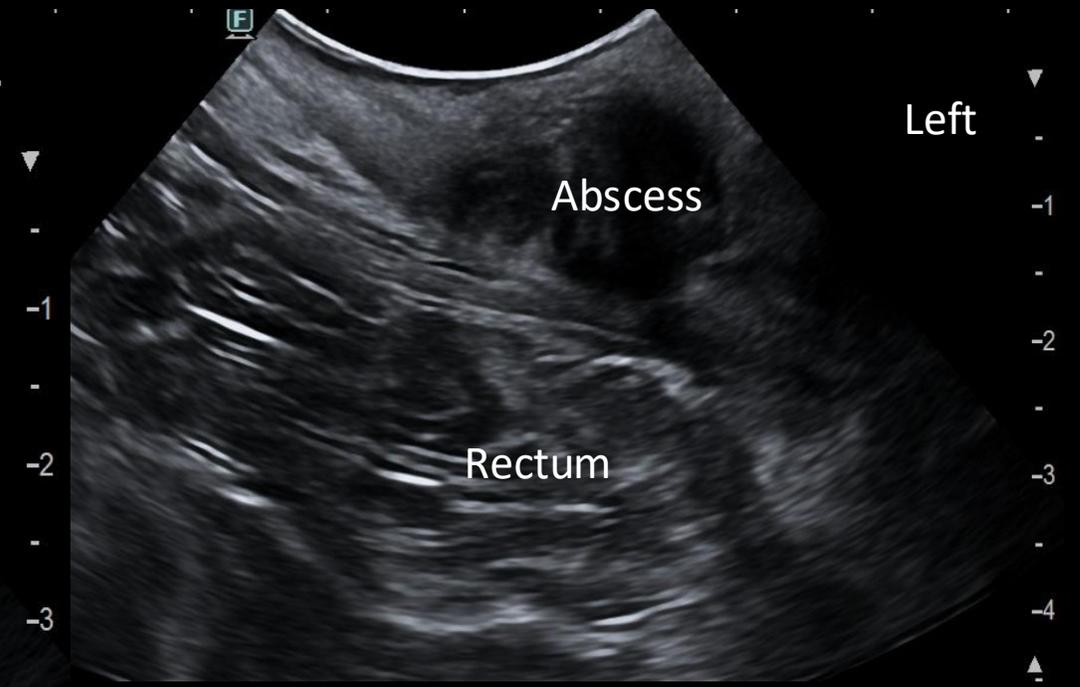




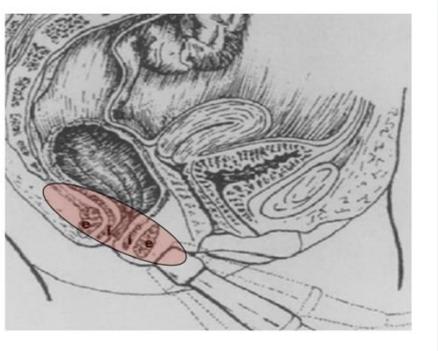
Perianal abscess



Sagittal section



Coronal section



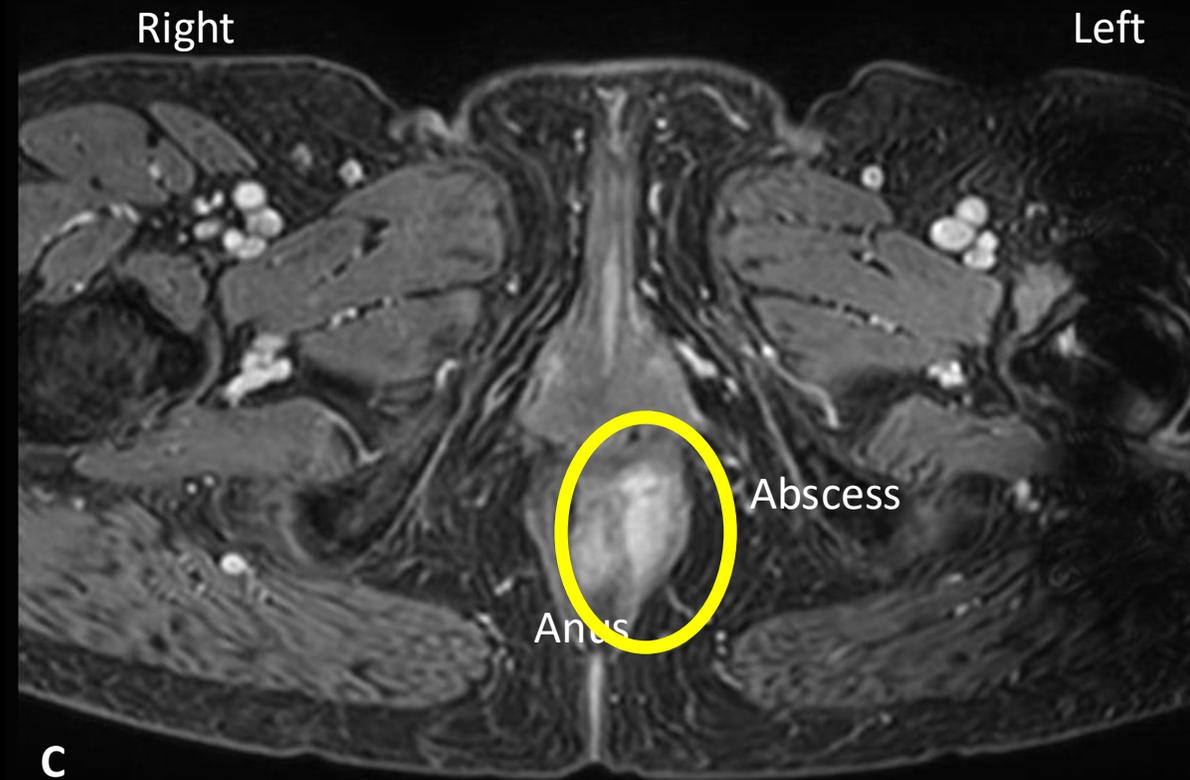
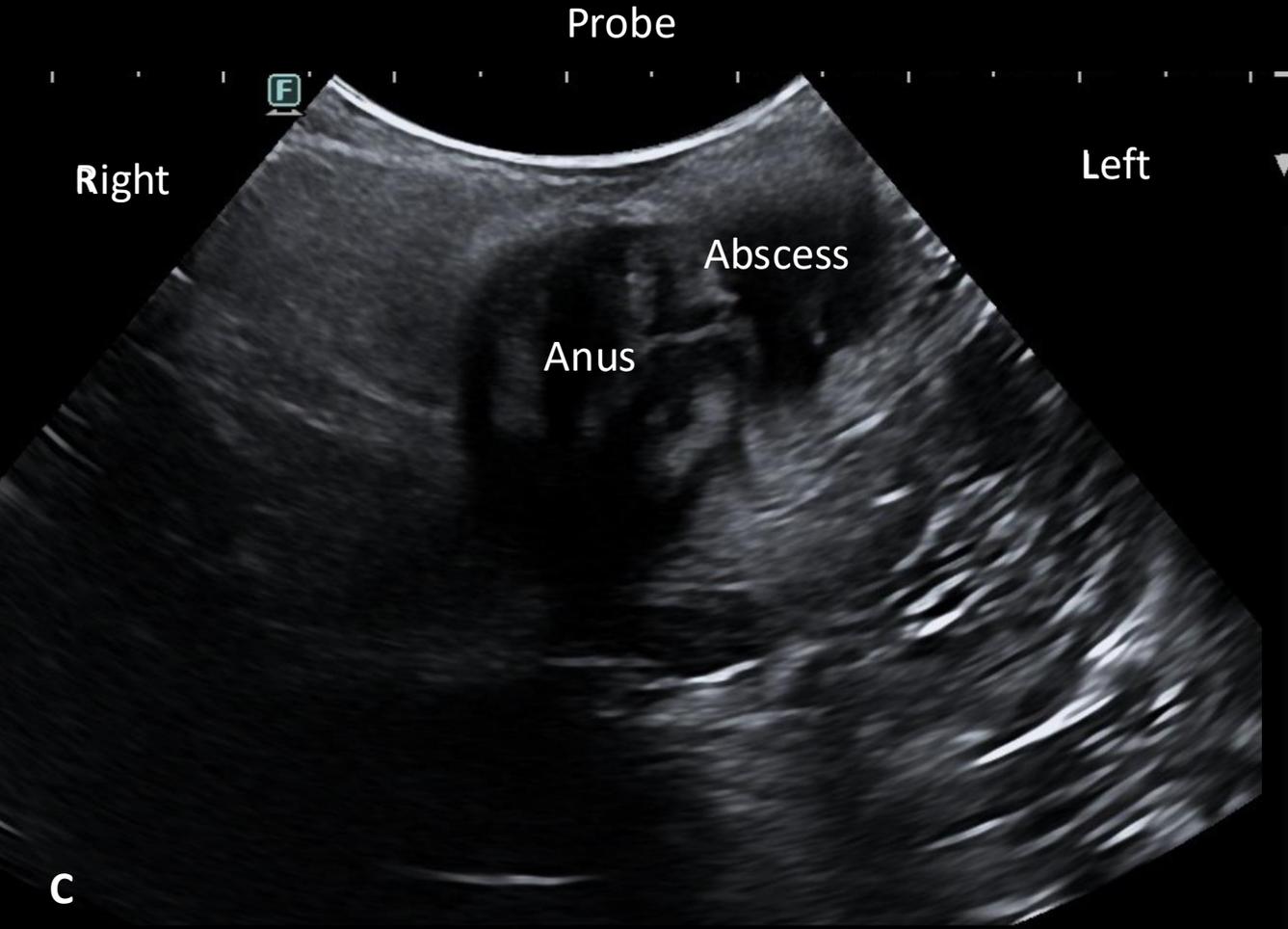
C42
HdT-5.0P R:5.00 BG:73 BD:89

ANSE Micro.



Perianal abscess

L





TPUS in UC

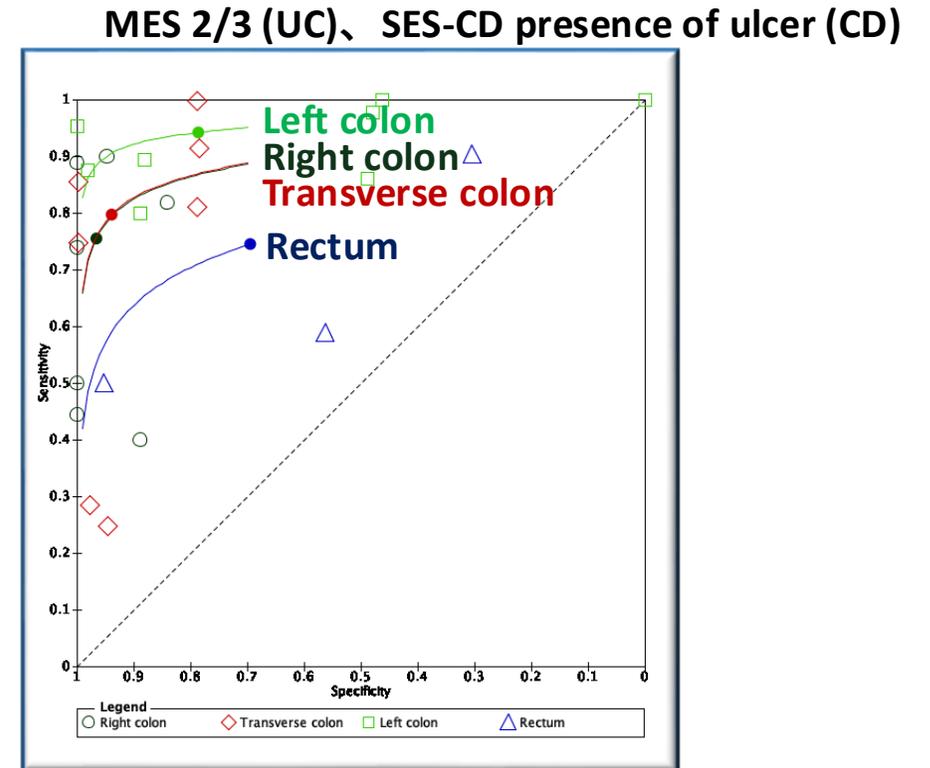
Why????

Diagnostic performance of BWT for inflammation in IBD

Systematic review and meta-analysis



Ultrasonography has higher diagnostic accuracy for detecting inflammation in colon than rectum

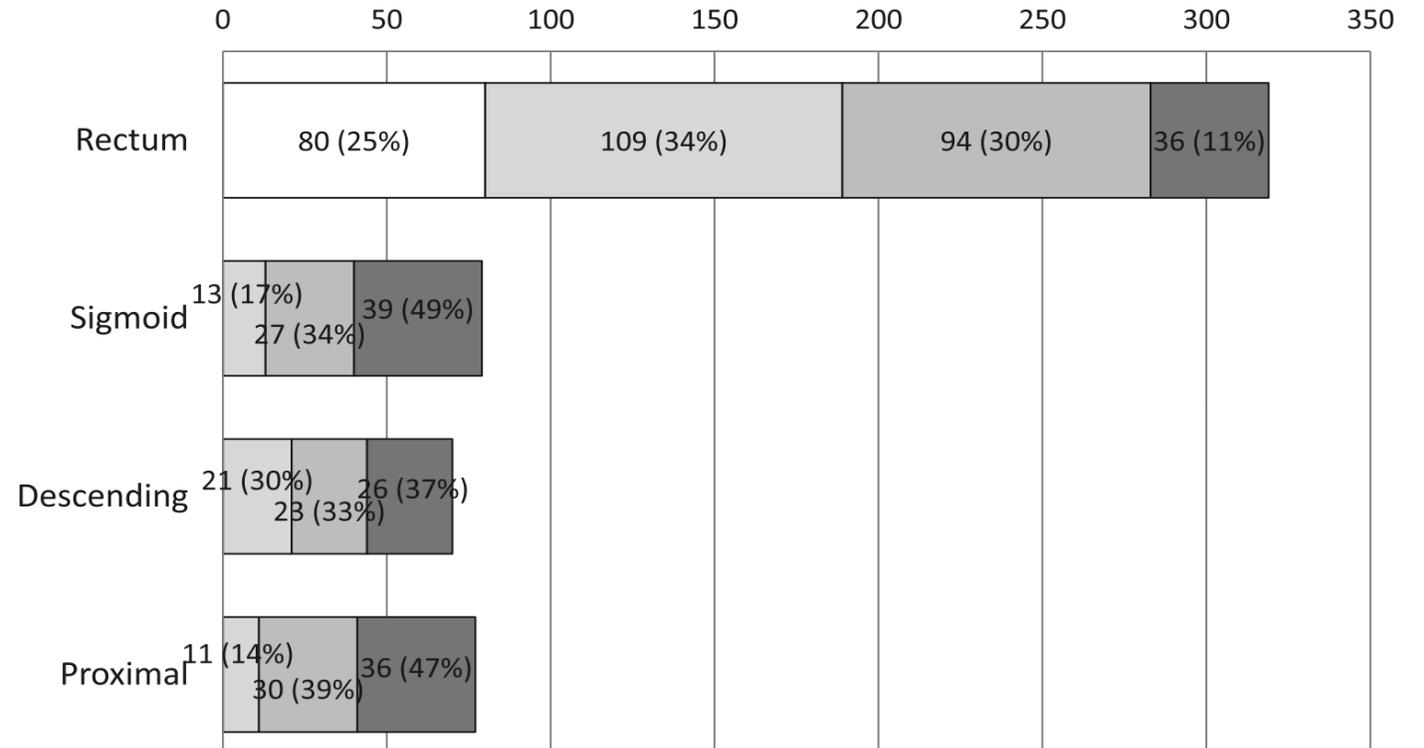


Why is rectal assessment important in UC?

Maximum activity (N=545 UC patients)

- Rectum: 319 (59%)
- Sigmoid colon: 79 (14%)
- Descending colon: 70 (13%)
- Proximal: 77 (14%)

Distribution of locations with maximum endoscopic activity.

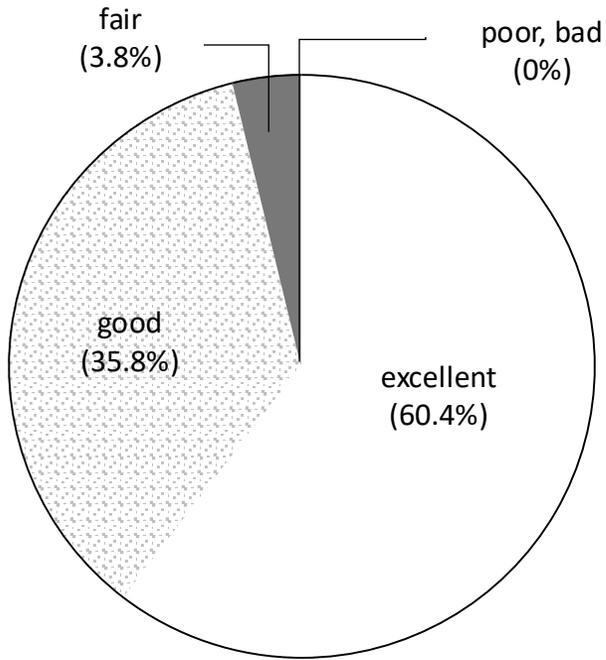


60% have the **most severe lesions in the rectum.**

Proctitis: About **1/3** of UC cases involve the rectum only

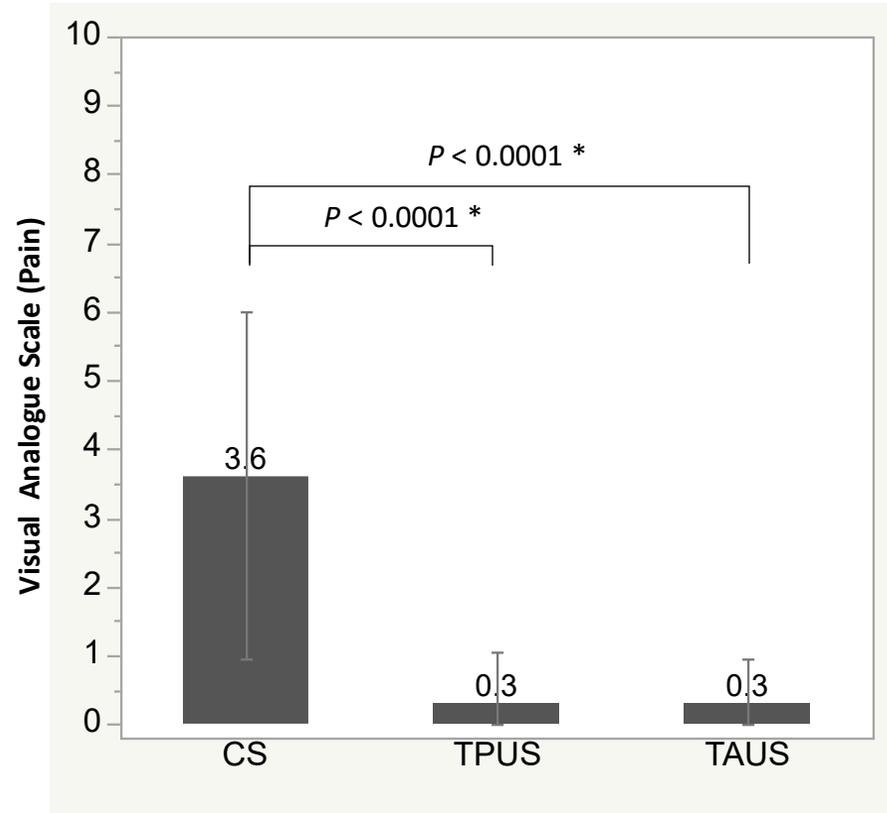
Acceptability of ultrasound comparing to colonoscopy

How was TPUS compared to colonoscopy?

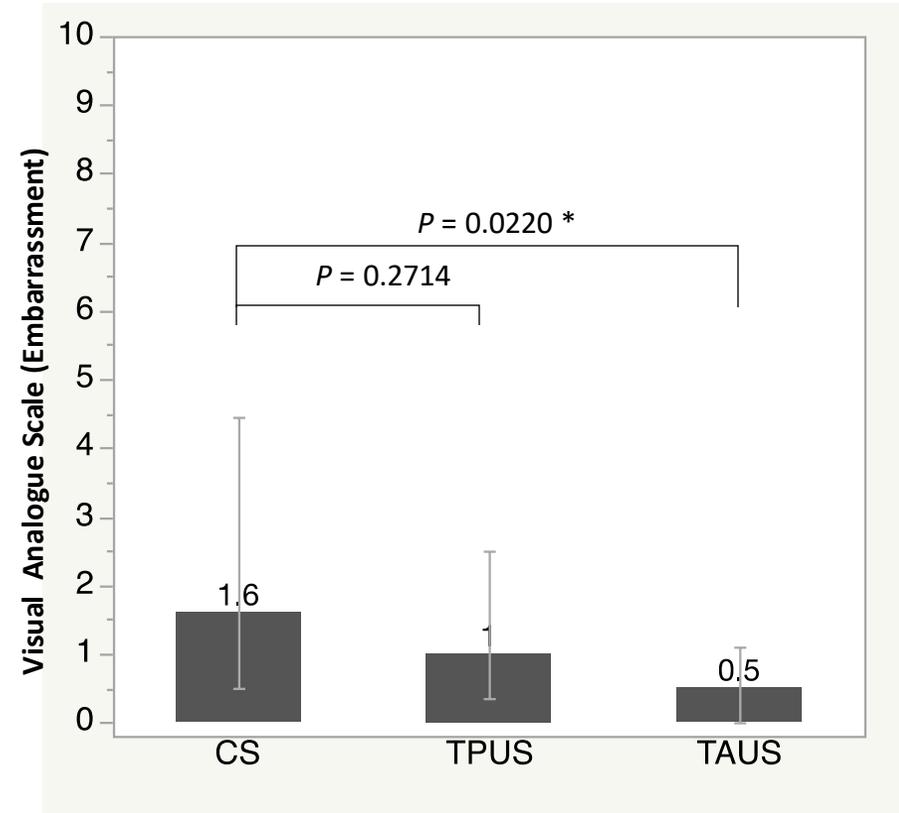


N = 53

Painful?



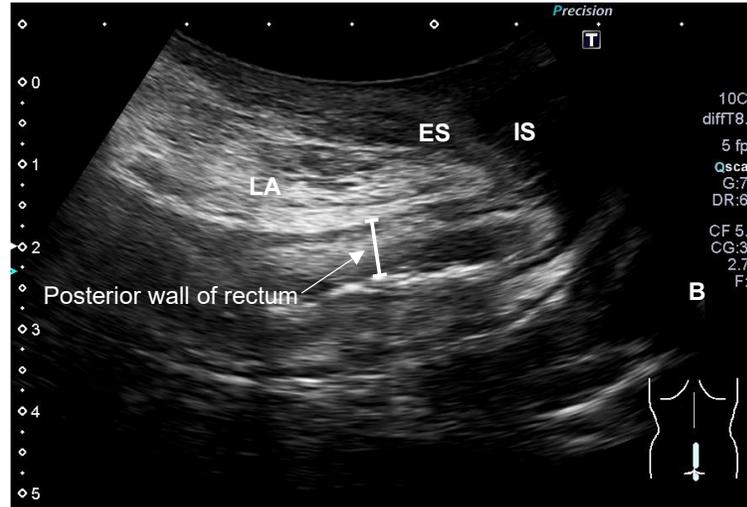
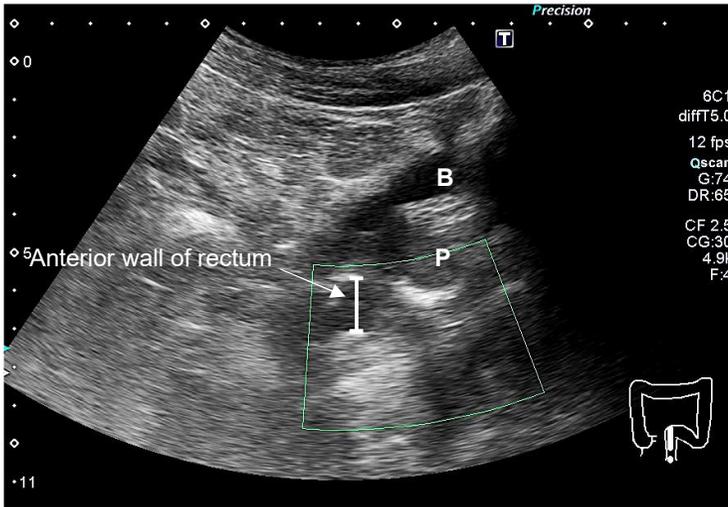
Embarrassing?



*Dunnett's test

Acceptability of TPUS was rated as excellent or good compared to colonoscopy by 96.2%.

The comparison between TAUS and TPUS



TAUS (BWT)

$r_s = 0.2989$, $p = 0.0314$

TAUS (Limberg)

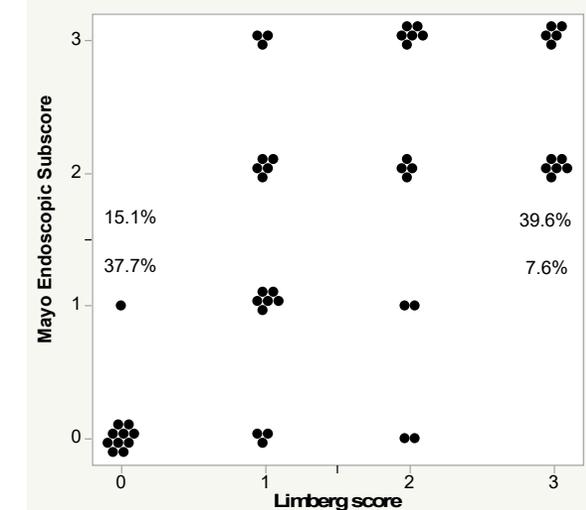
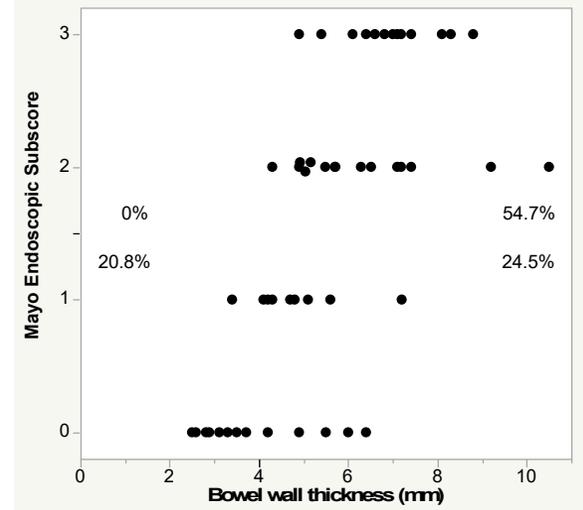
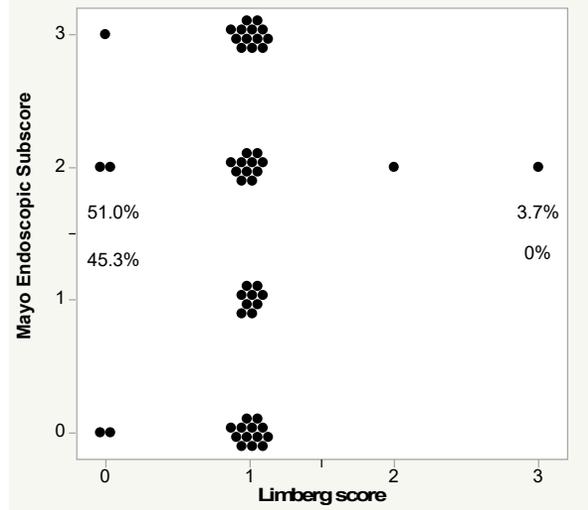
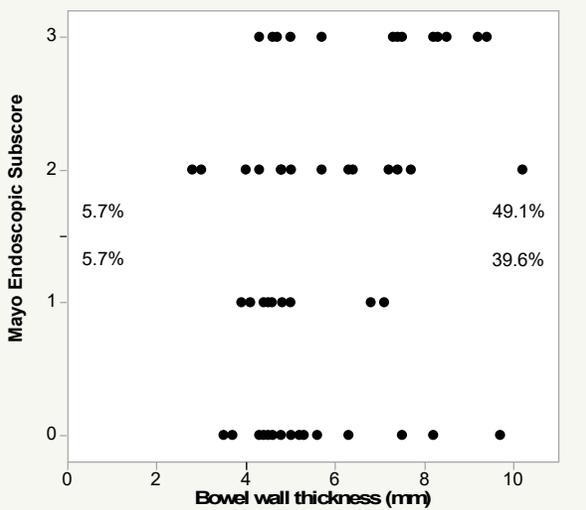
$r_s = 0.0649$, $p = 0.6442$

TPUS (BWT)

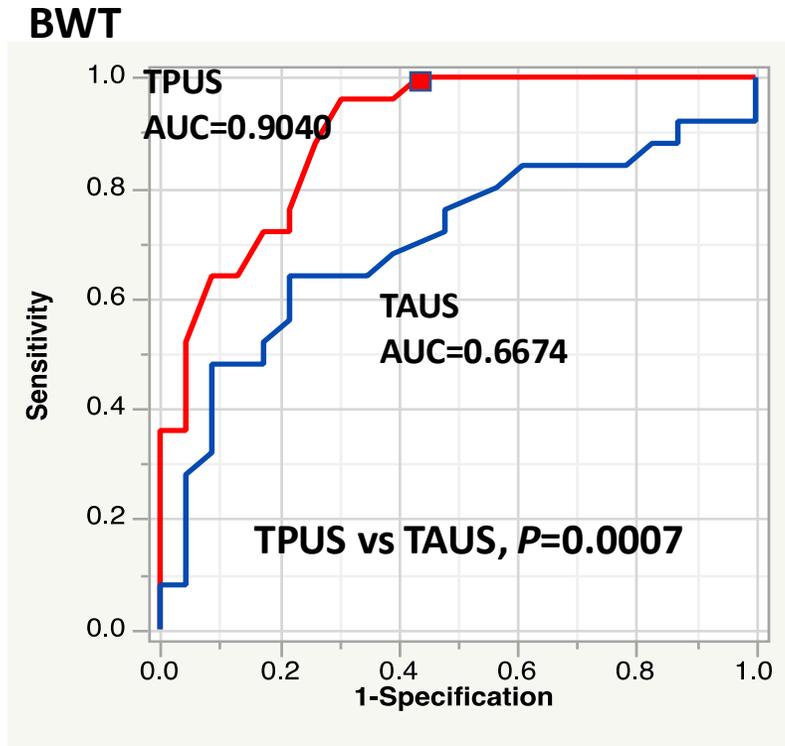
$r_s = 0.7204$, $p < 0.0001$

TPUS (Limberg)

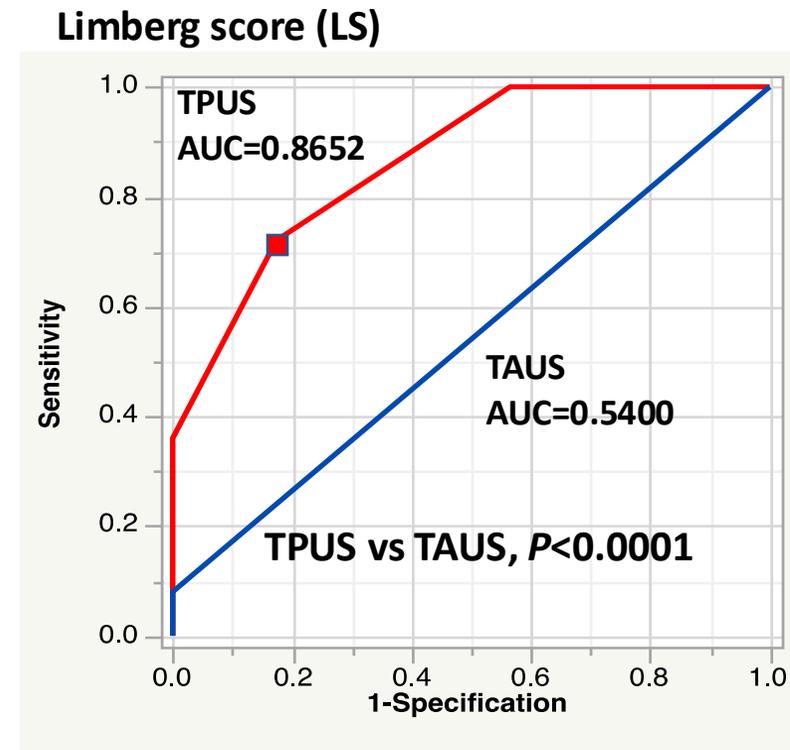
$r_s = 0.6619$, $p < 0.0001$



ROC curve analysis TPUS vs TAUS to predict MES 0 or 1



BWT (TPUS) ≥ 4 mm : Sensitivity 100%, Specificity 45.8%

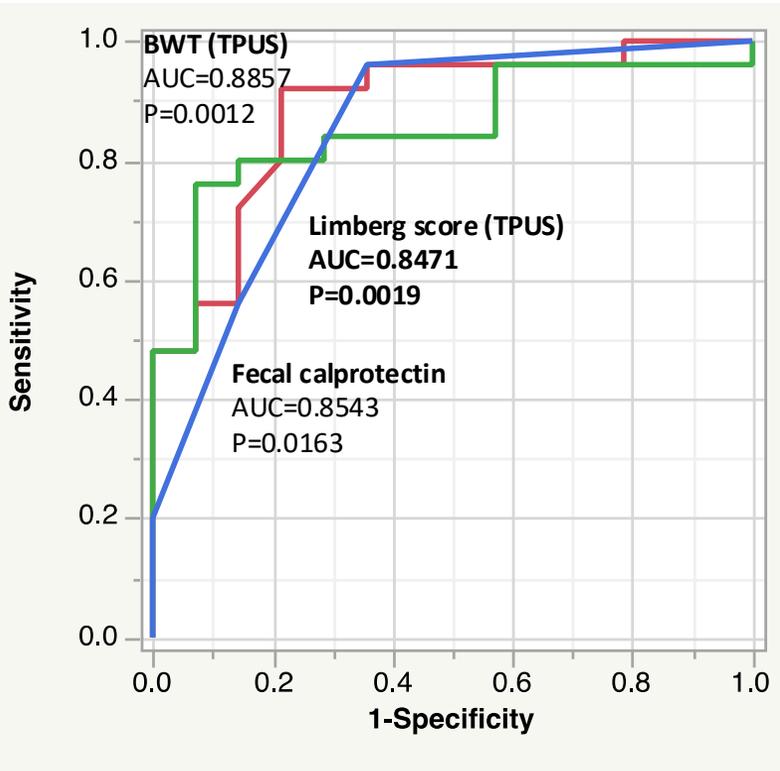


(N=53)

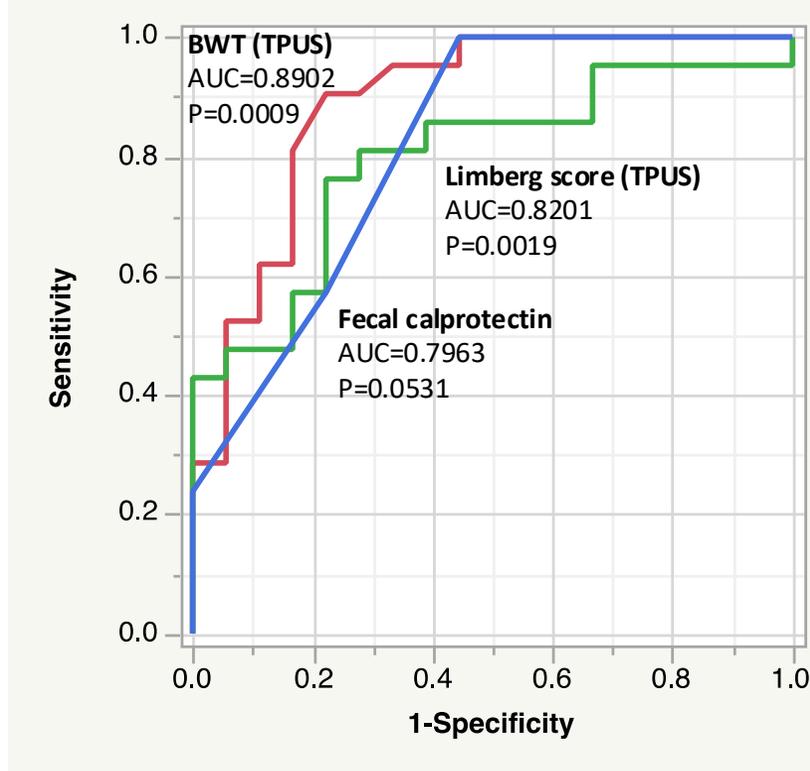
LS (TPUS) ≥ 2 : Sensitivity 66.7%、 Specificity 81.8%

ROC curve analysis for active lesion (histological index)

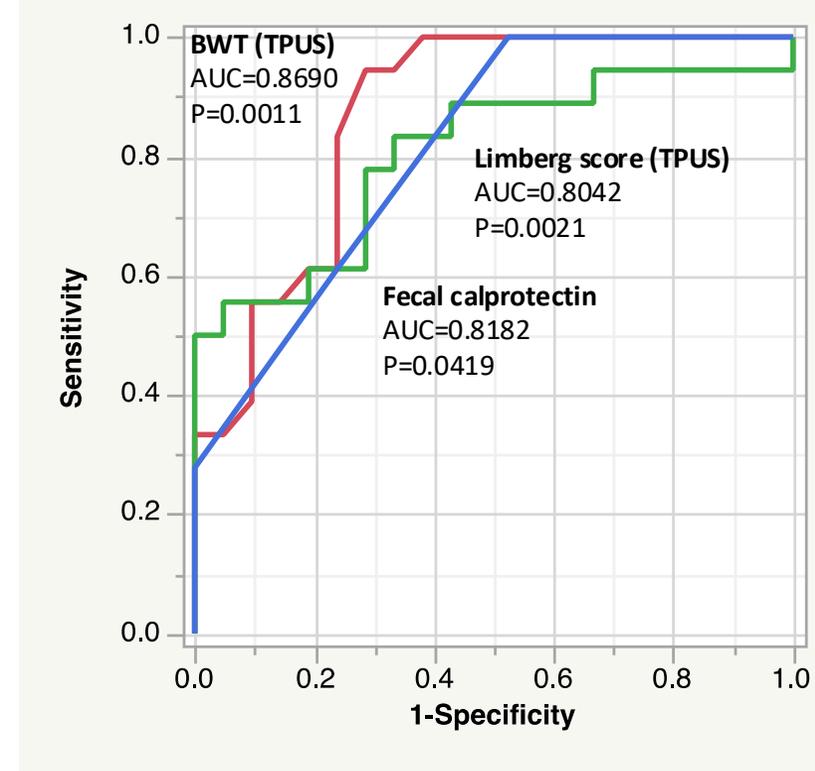
Geboes score ≥ 2.1



Robarts histopathological index > 6



Nancy histological index > 1



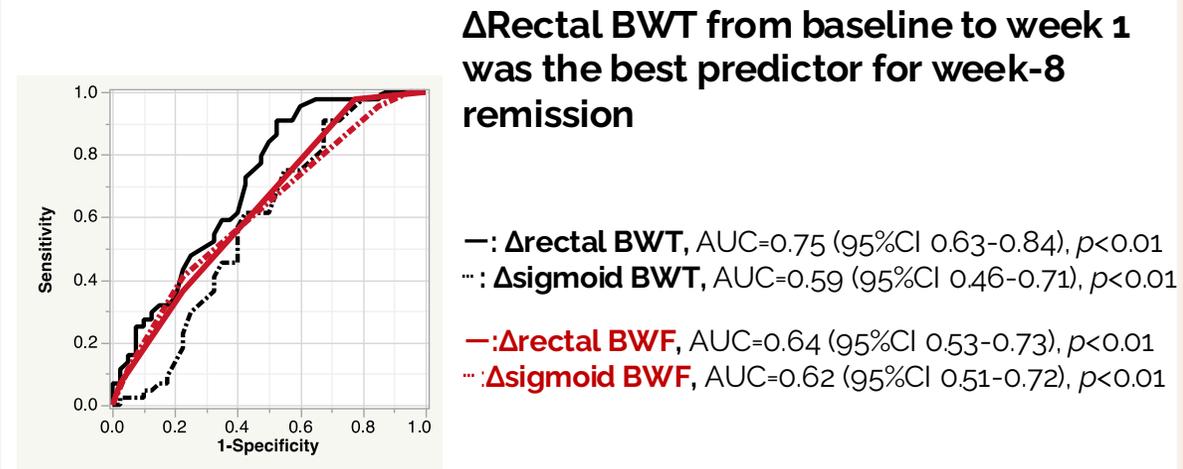
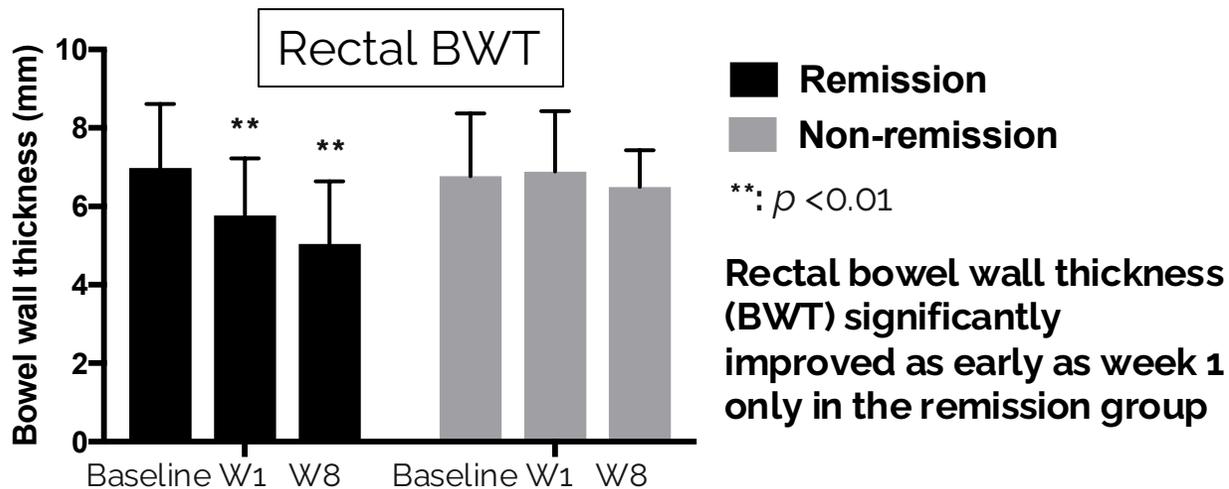
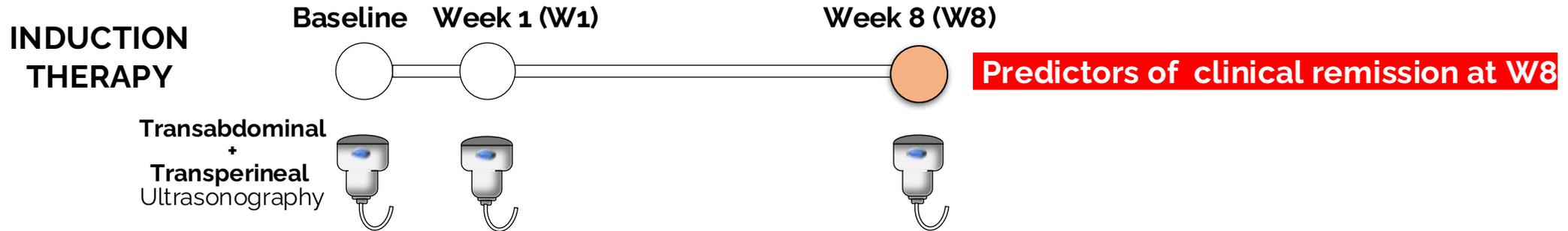
BWT (TPUS) $\geq 4\text{mm}$: Sensitivity 93-96%, Specificity 41-64%, 6mm, Sensitivity 51-54%, Specificity 85-92%,

(N=43)

LS (TPUS) ≥ 2 : Sensitivity 55-59%、 Specificity 76-86%

FC $\geq 100 \mu\text{g/g}$: Sensitivity 84-89%、 Specificity 52-64%

Early improvement in bowel wall thickness on transperineal ultrasonography predicts treatment success in active ulcerative colitis



Reproducibility of TPUS in Pediatric UC

STUDY POPULATION

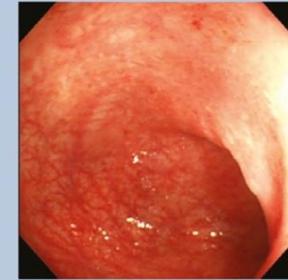
- Pediatric (<19 years of age)
- Ulcerative colitis (UC) cases diagnosed by colonoscopy (CS) and histology from Jan 2019 to Jun 2021.

Objective: to compare the accuracy of transperineal ultrasonography (TPUS) to that of CS.

Grouped based on CS findings

- 30 patients: UC MES 0–1
- 57 patients: UC MES 2–3

MES = Mayo endoscopic sub-score



UC (MES 1)

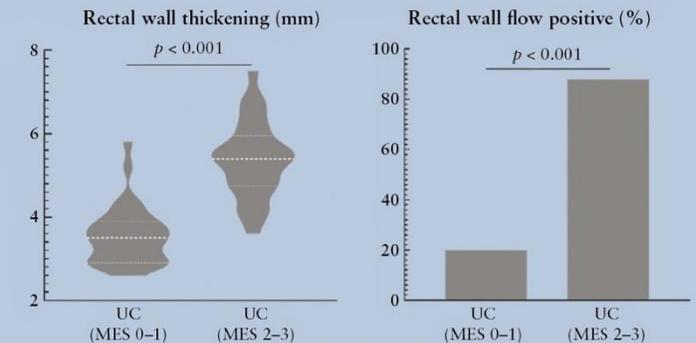


UC (MES 3)

Rectal wall thickness (RWT) and rectal wall flow (RWF) determined by TPUS were independent predictors of UC endoscopic activity.

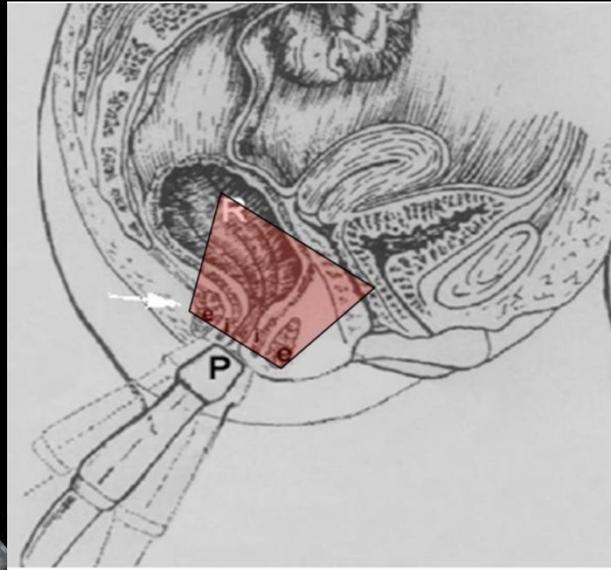
<RWT ≥ 4.5 mm + RWF positive>

Sensitivity 95.8%
Specificity 100%

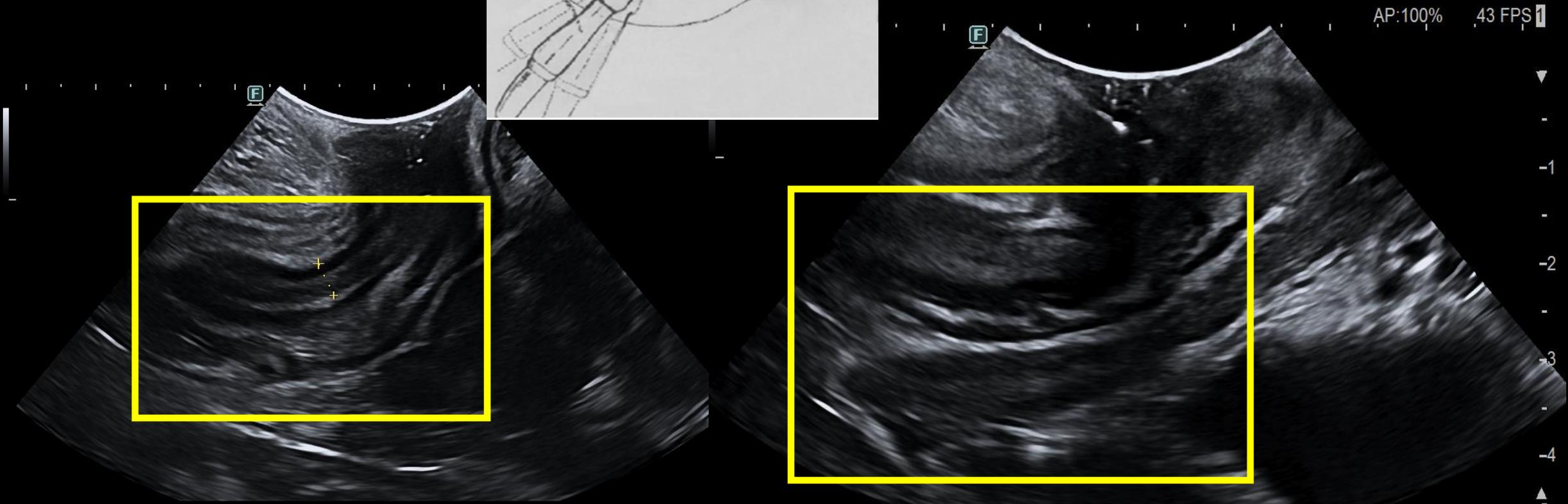




Sagittal scan



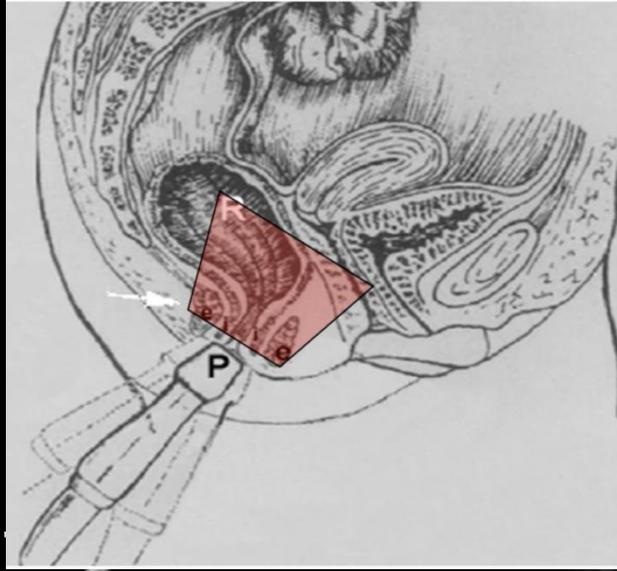
Probe on the anus
parallel to the bed



C42
HdT-7.4Rx R:6.00 BG:80 BD:89

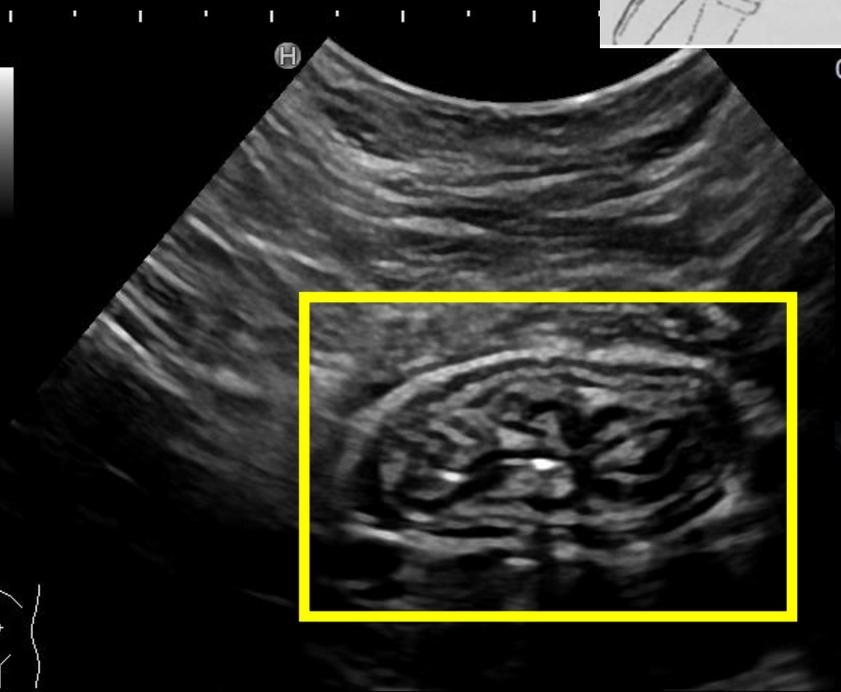
ANSE M
139 C42
HdT-7.4Rx R:5.00 BG:73 BD:89

ANSE Micro.
158/160

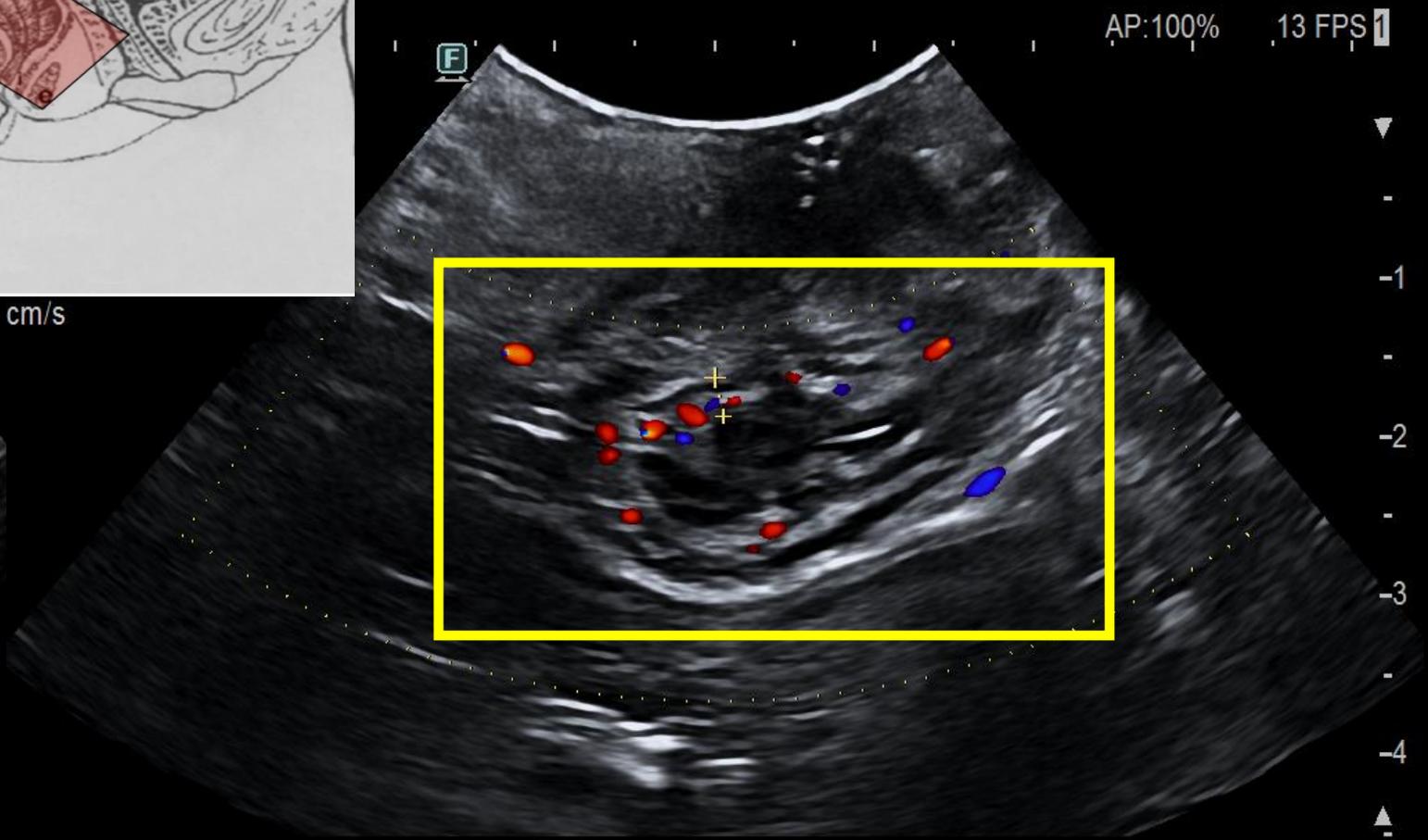


Probe on the anus
perpendicular to the bed

Coronal scan

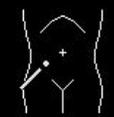


cm/s



C42 **+**Dist: 2.5mm
HdT-7.4Rx R:5.00 BG:73 BD:89
0.5k/4.00MHz CG:49

ANSE Micro.
19/23





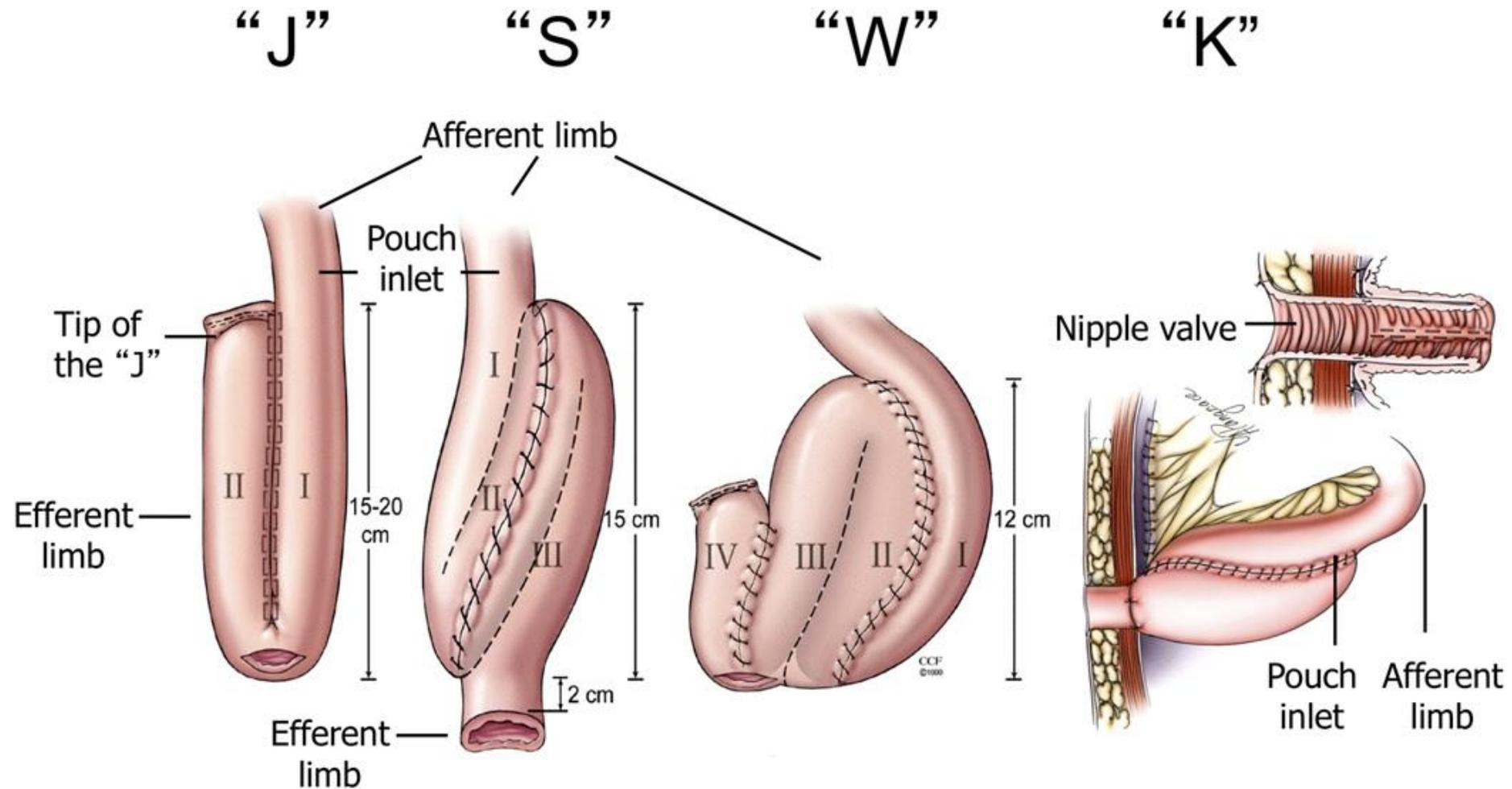
Coronal
scan





TPUS in pouch

The ileo-anal Pouch



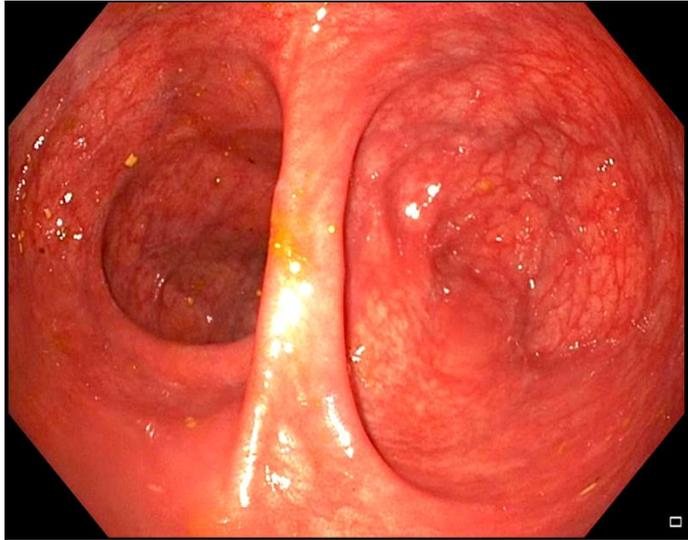


Why????

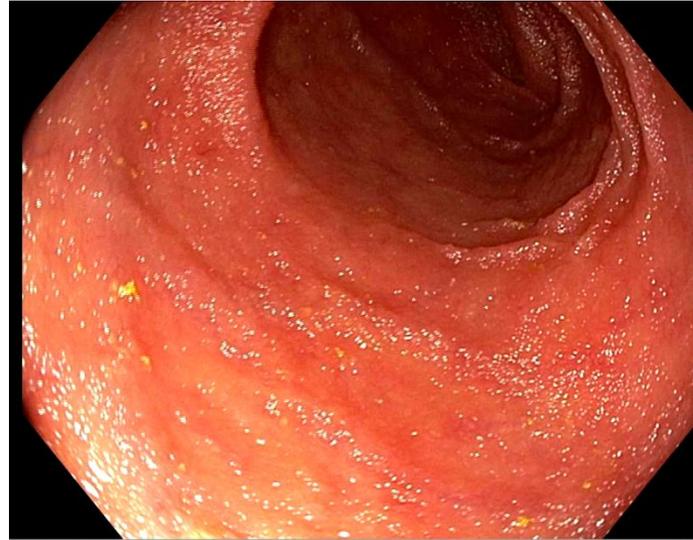
Pouch Symptoms are Commons and not Specific

- ✓ Inflammatory : idiopathic pouchitis, cuffitis, pre-pouch ileitis, Crohn's-like disease
- ✓ Non inflammatory: Irritable pouch syndrome- in nearly a third

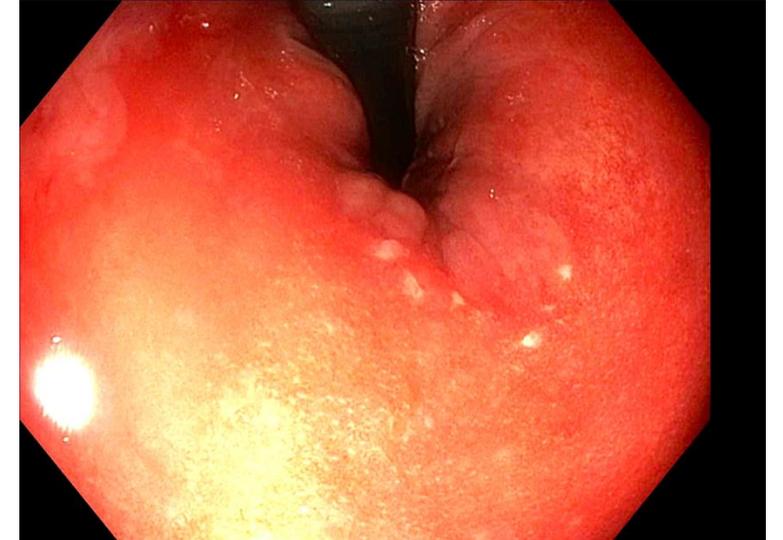
Pouchoscopy has limitations



Pouch body



Pre-pouch ileum

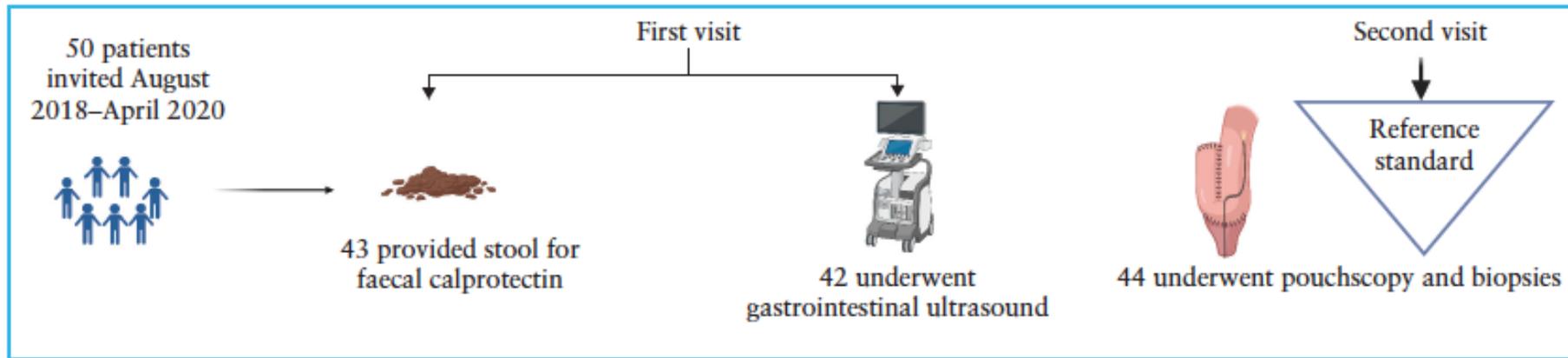


Cuff

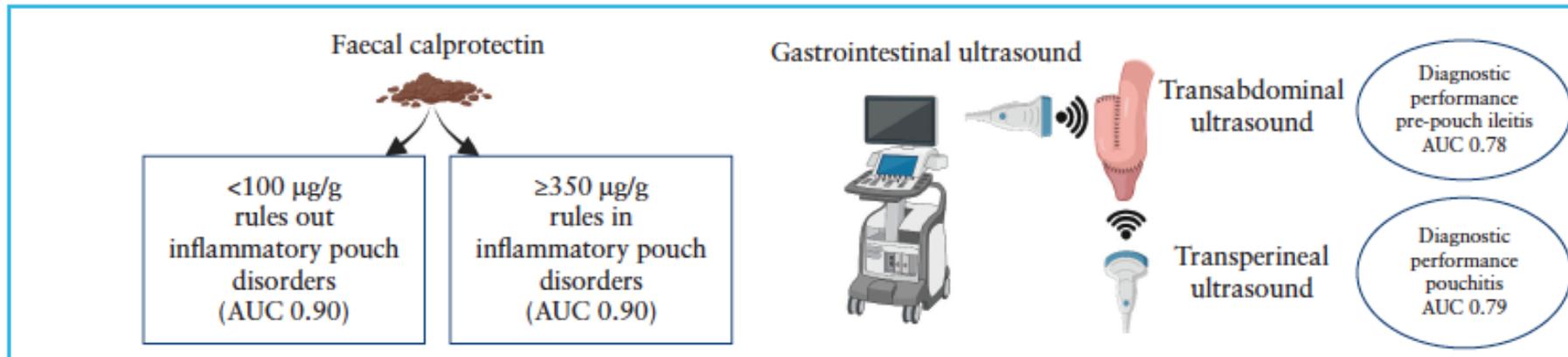
1. Invasive and not practical for assessing every symptomatic episode
2. Imperfect gold standard with ongoing debate regarding the validity of individual endoscopic and histologic components
3. Efforts are underway to refine and improve its diagnostic accuracy

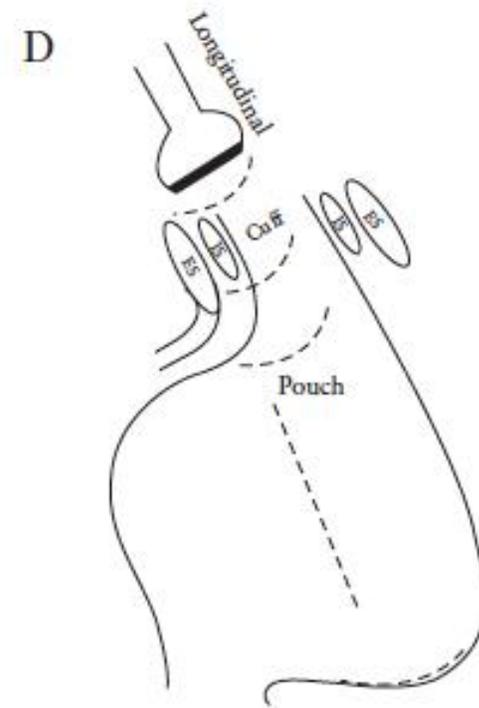
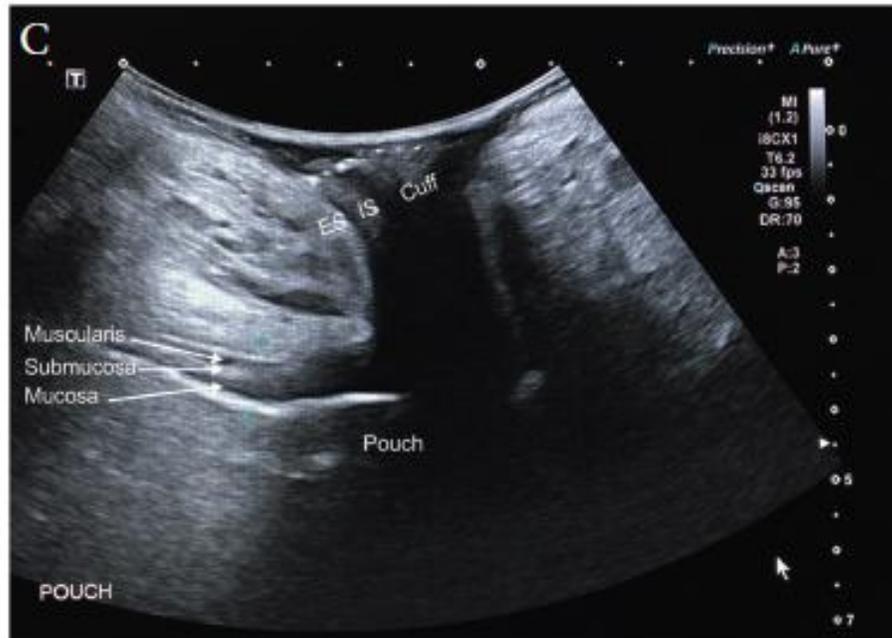
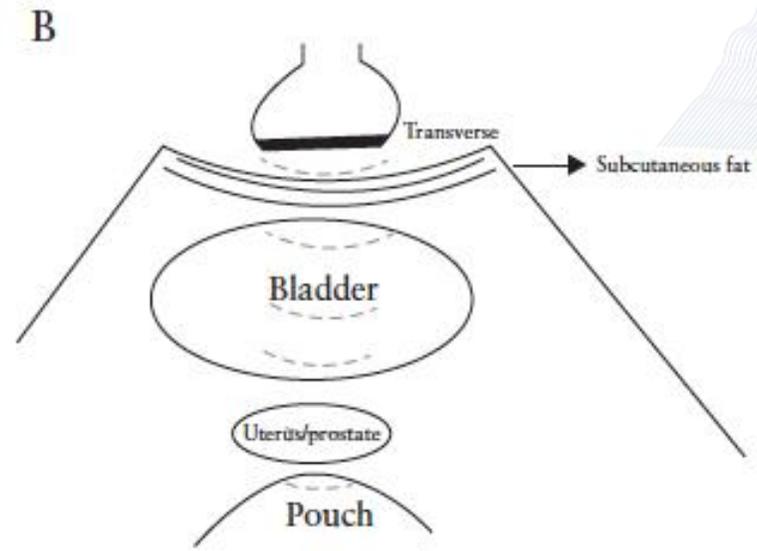
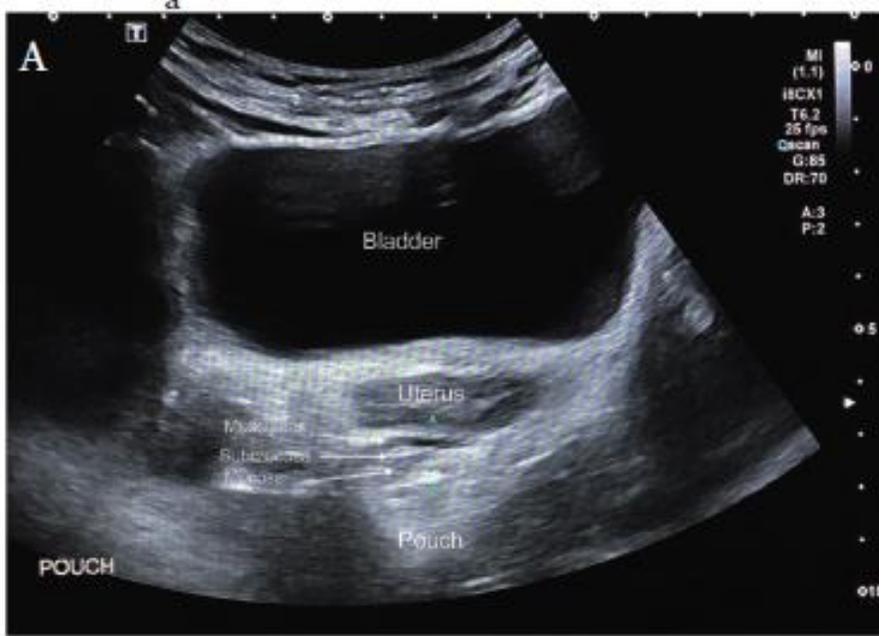
Accuracy of Gastrointestinal Ultrasound and Calprotectin in the Assessment of Inflammation and its Location in Patients with an Ileoanal Pouch

① Two-visit cross-sectional study consecutively enrolled patients with ileoanal pouches in Australia



② Faecal calprotectin and gastrointestinal ultrasound are accurate non-invasive tests for assessing ileoanal pouches





Accuracy of Gastrointestinal Ultrasound and Calprotectin in the Assessment of Inflammation and its Location in Patients with an Ileoanal Pouch



international bowel
ULTRASOUND GROUP

TPUS

Zaid S Ardalan,^{a,○} Antony B. Friedman,^a Danny Con,^{b,○}
Sujievan Chandran,^c David Gibson,^a Alan Pham,^d Peter De Cruz,^c
Kwang Tay,^e Stephen Bell,^f Ourania Rosella,^a Miles P. Sparrow,^a
Peter R. Gibson^a

Good views of the pouch body 78%, but only 25% of the cuff

Healthy BMI tended to be associated with better views (90% vs 63%; $p=0.06$)

Pouch wall thickness 4.2 (3.2-5.7) mm vs 2.8 (2.4-3.8) mm ($p=0.001$)

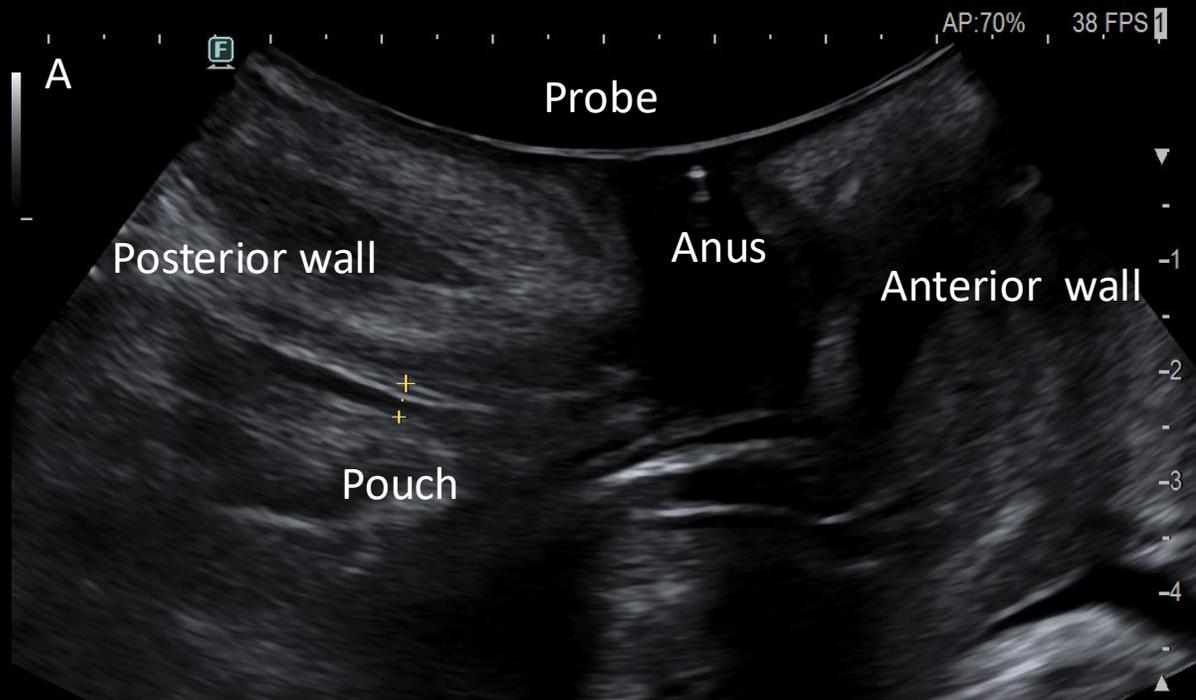
ROC

BWT for dx pouchitis AUC of 0.79 [0.66-0.93]; $p<0.0001$)



Pouch

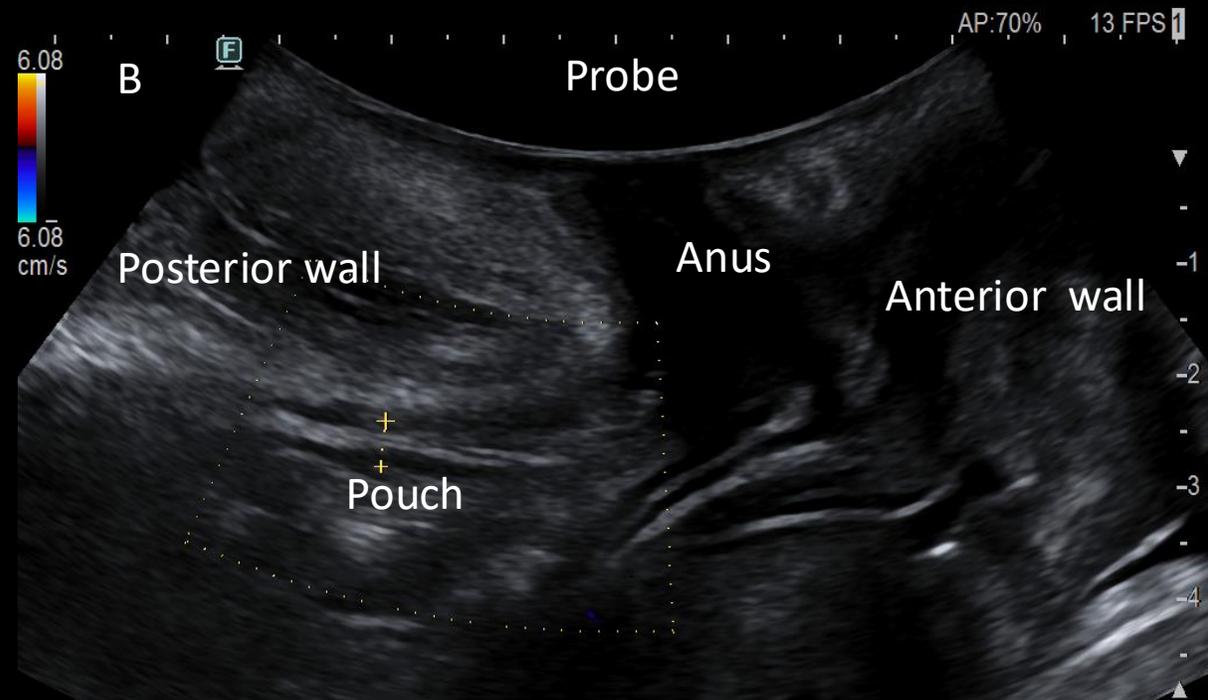
Sagittal scan



C252
HdT-5.0H

Dist: 3.1mm
R:6.00 BG:72 BD:85

ANSE Convex
1577/1578



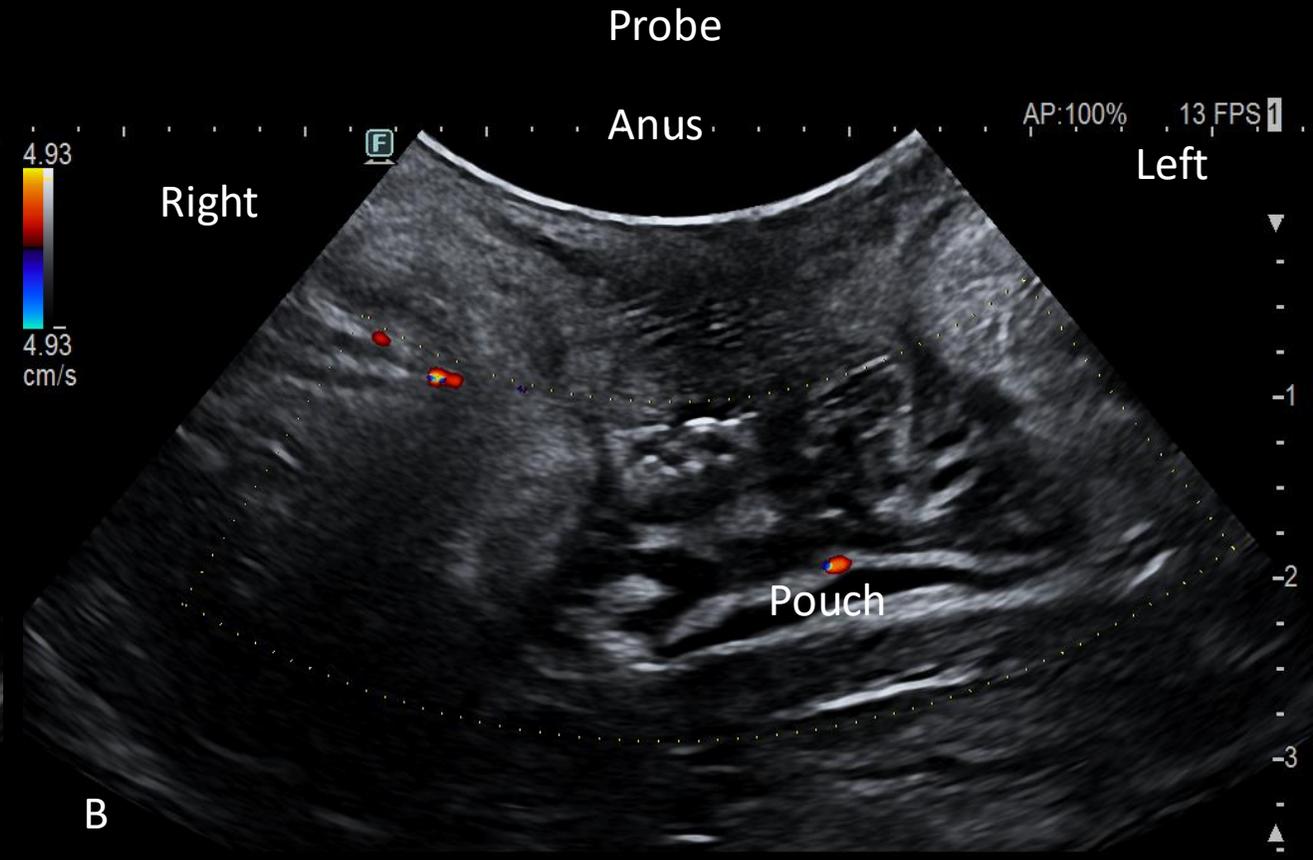
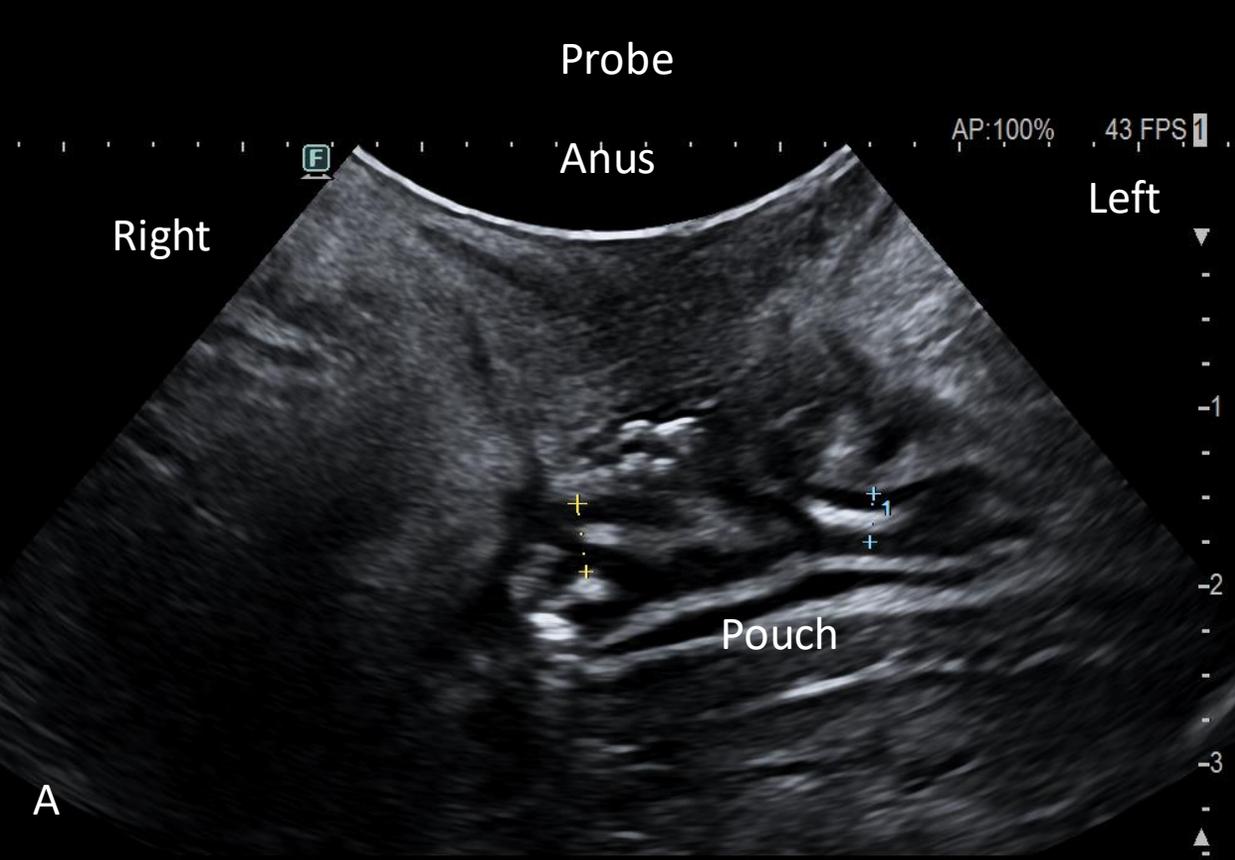
C252
HdT-5.0H
0.5k/3.16MHz

Dist: 4.1mm
R:6.00 BG:72 BD:85
CG:71

ANSE Convex
53/53



Pouch Coronal scan



42
dt-5.0P
Dist: 2.7mm Dist: 3.9mm
R:4.00 BG:73 BD:89

ANSE Micro.
1946/1947

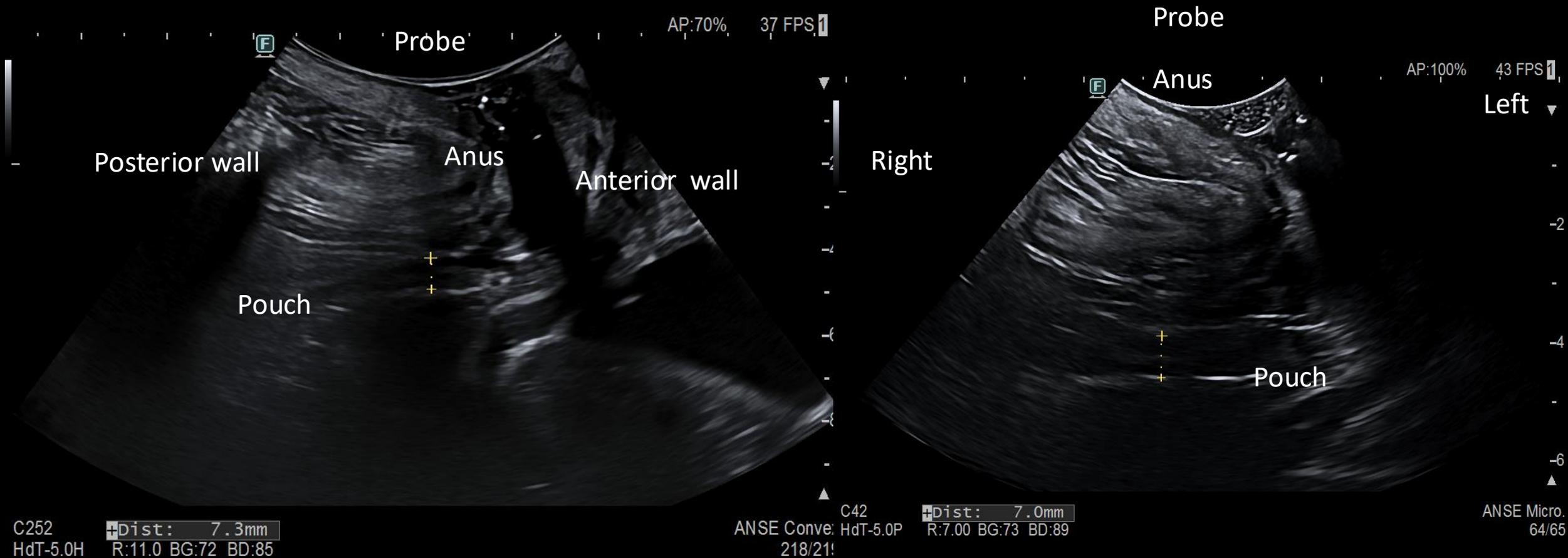
C42
HdT-5.0P R:4.00 BG:73 BD:89
0.5k/4.00MHz CG:49

ANSE Micro.
51/54



Pouchitis

Sagittal and coronal scan





intern
ULTRA



MI 0.85 TIS < 0.4 AP: 100% 43 FPS 1



▼
-
-1
-
-2
-
-3
-
-4
▲

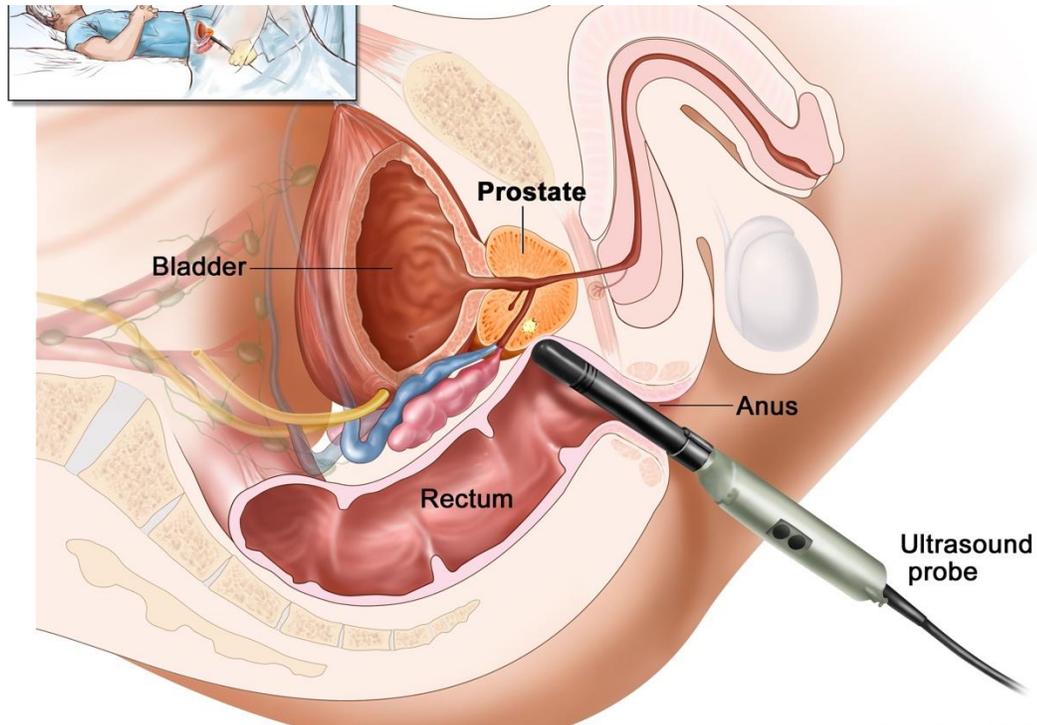
C42
HdT-5.0P R:5.00 BG:73 BD:89

ANSE Micro.

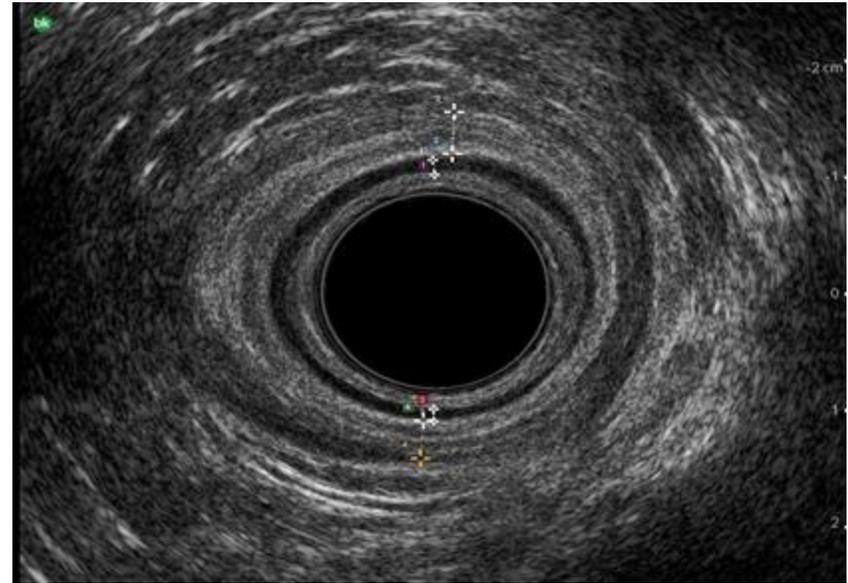
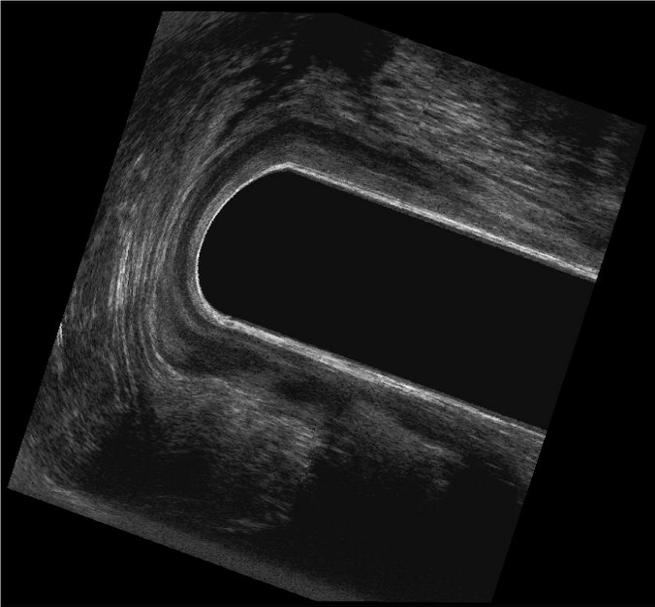
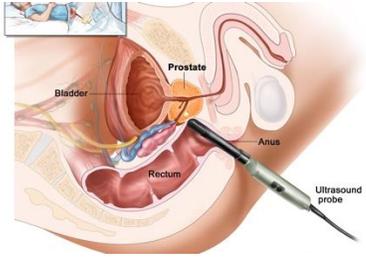


Transrectal Ultrasound

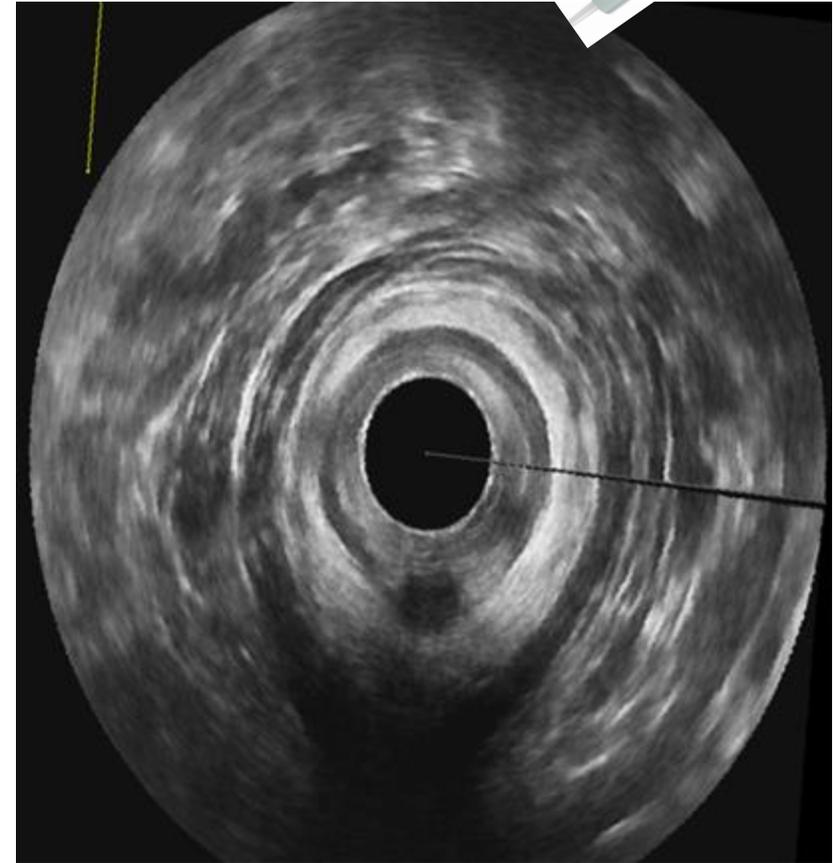
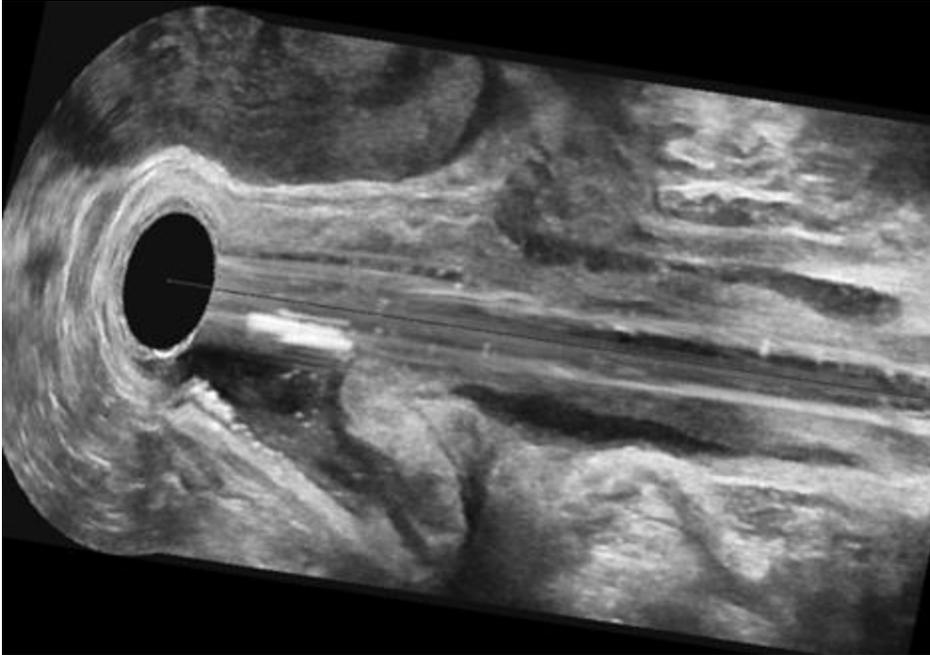
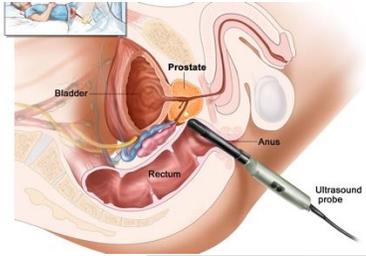
Transrectal ultrasound-360°



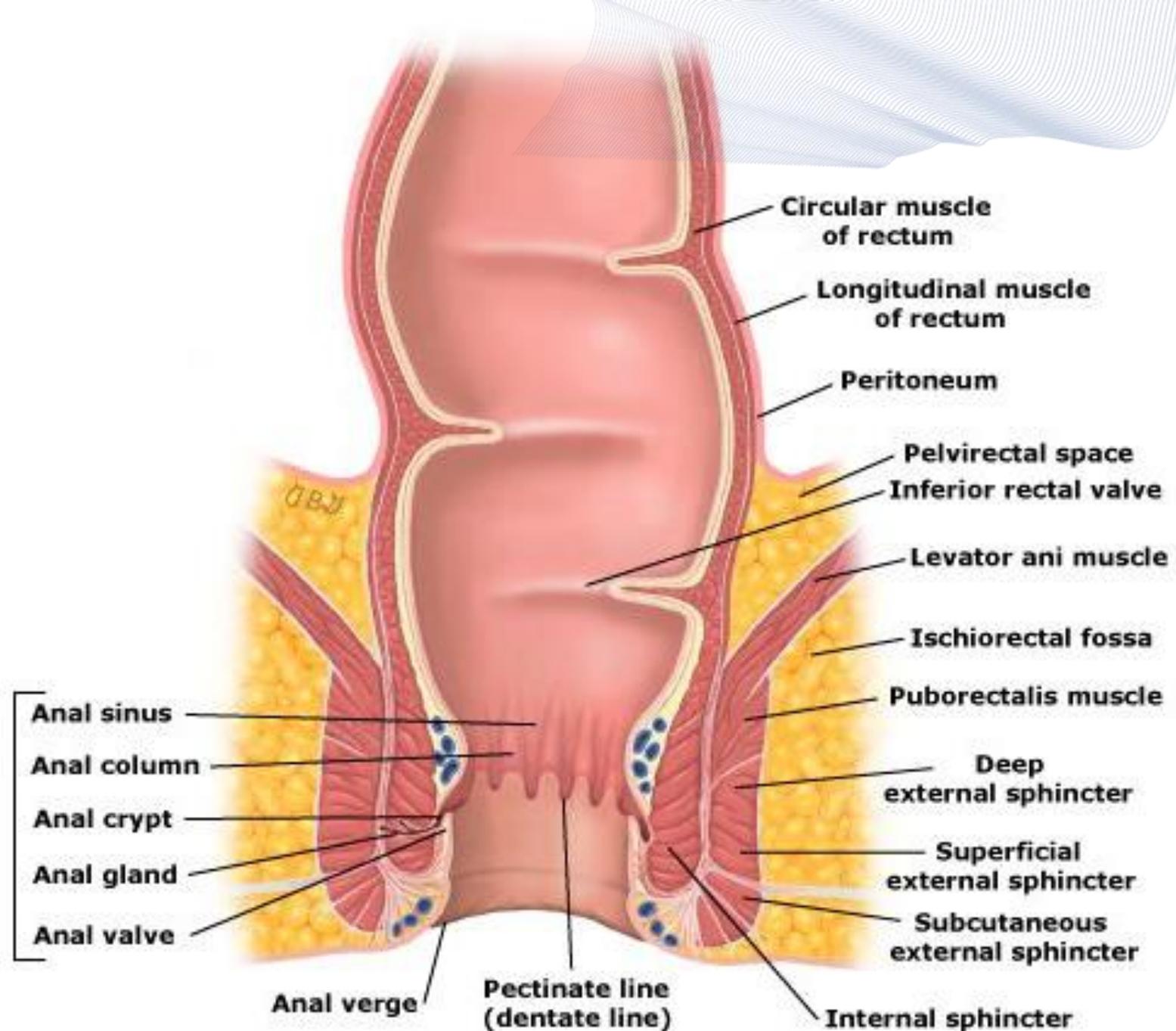
Transrectal ultrasound-360°



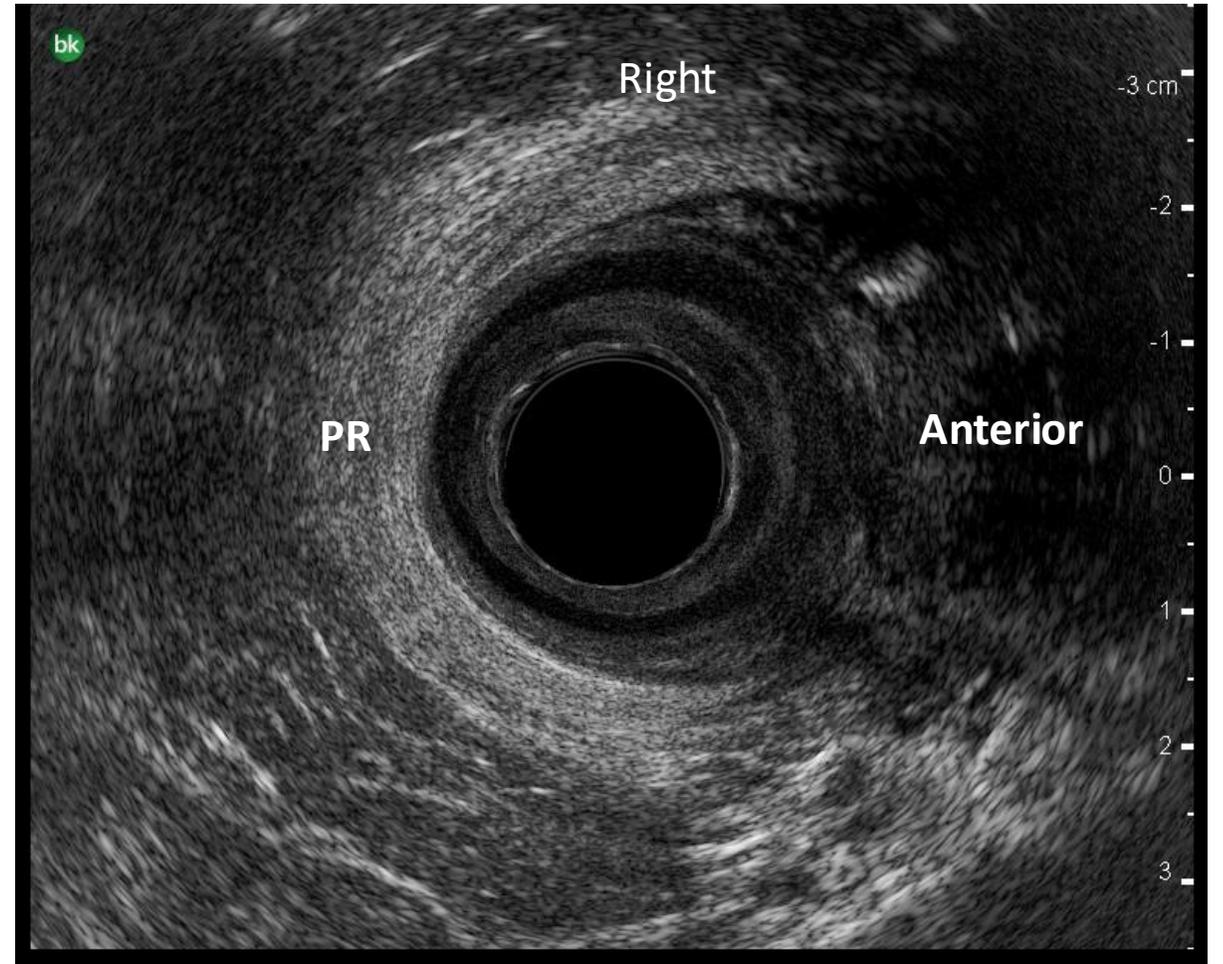
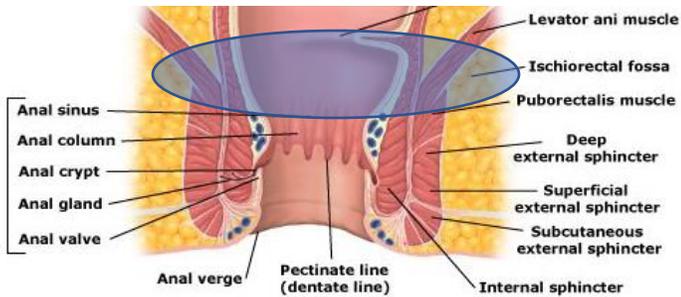
Transrectal ultrasound-High Resolution Color and 3D Imaging



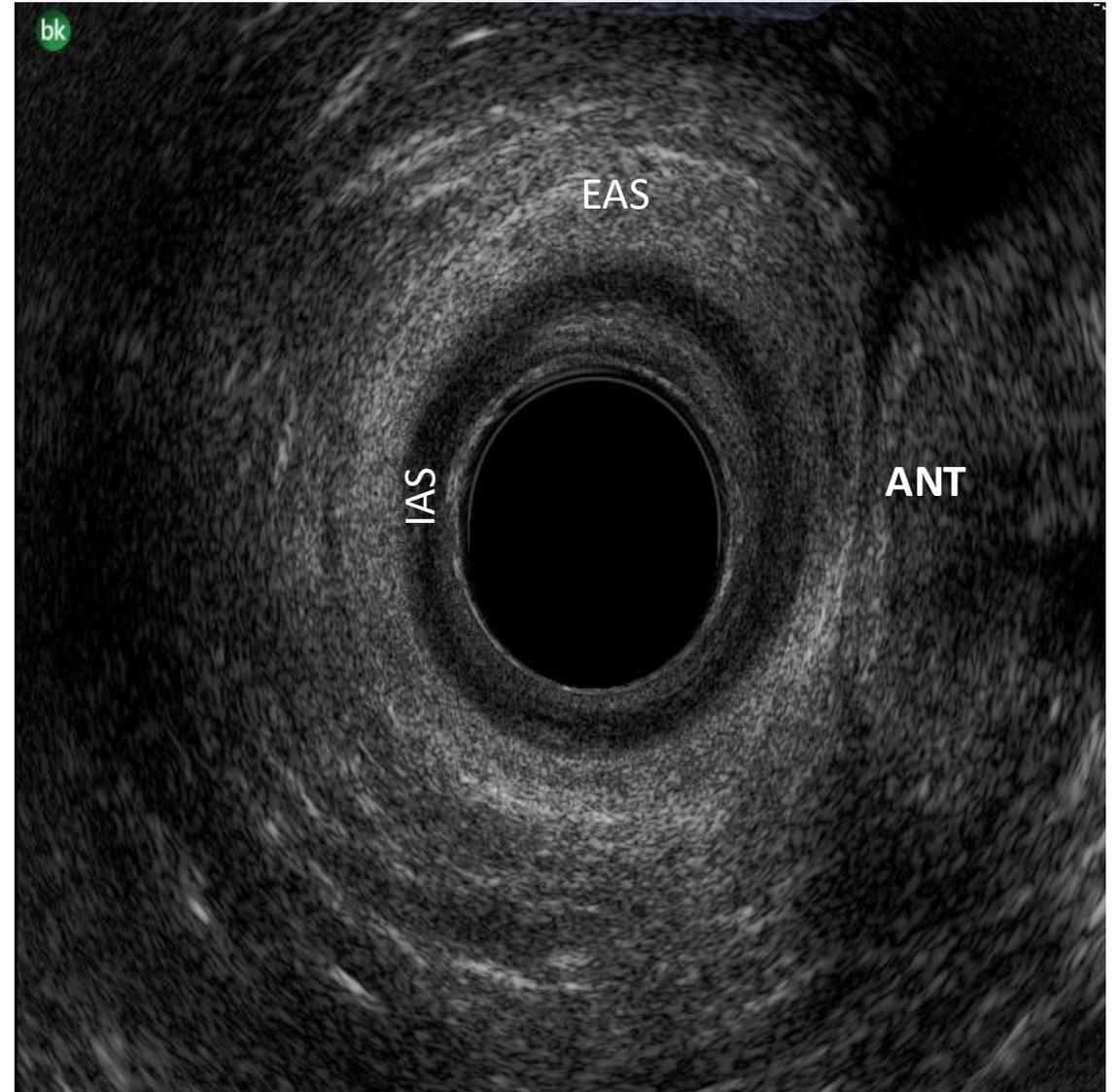
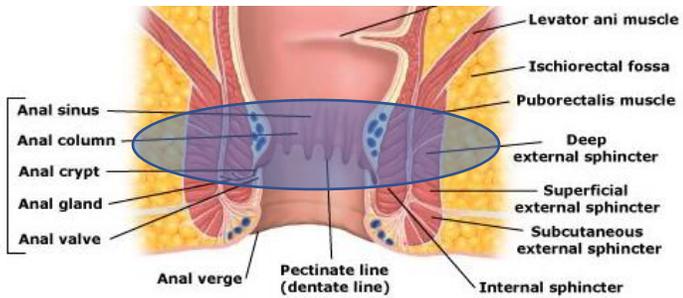
Anal Canal and Rectum- Anatomy



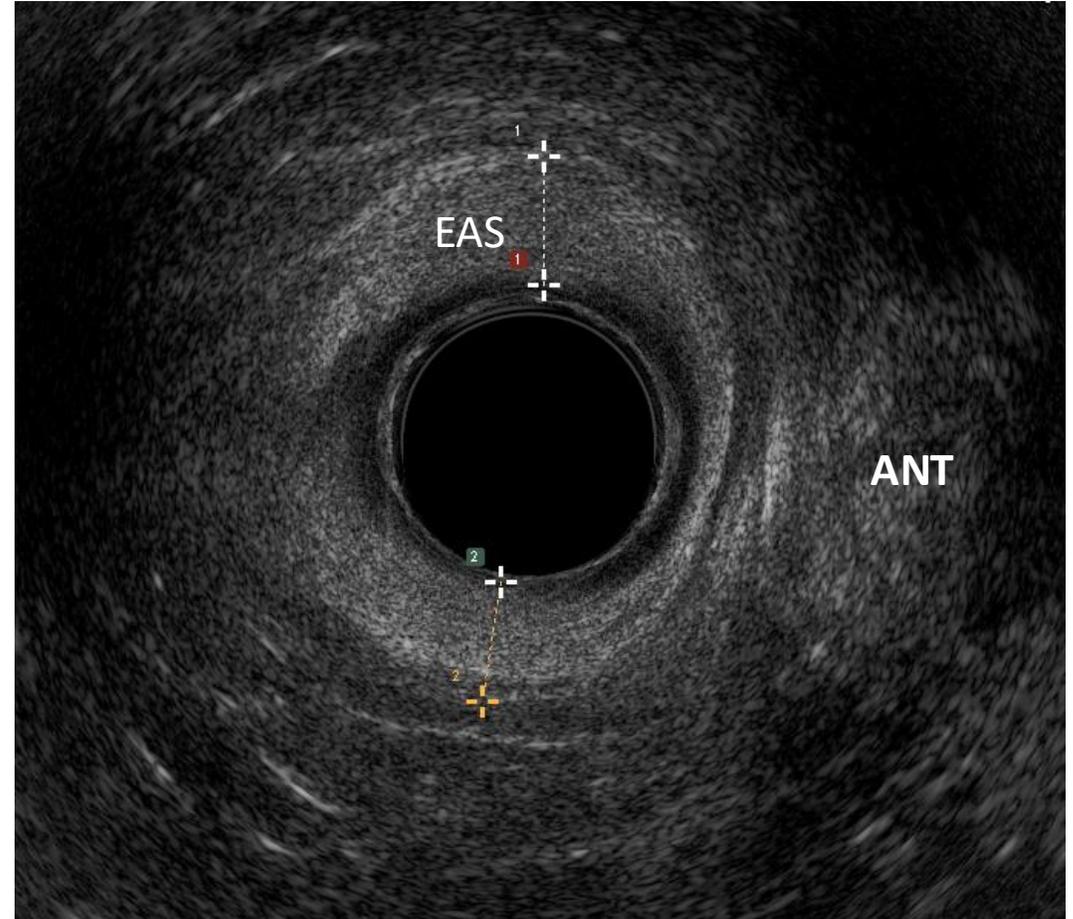
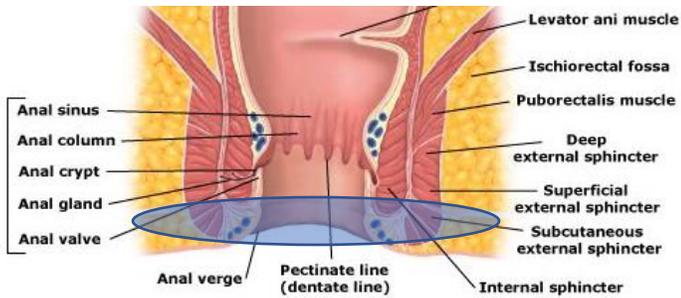
Upper anal canal



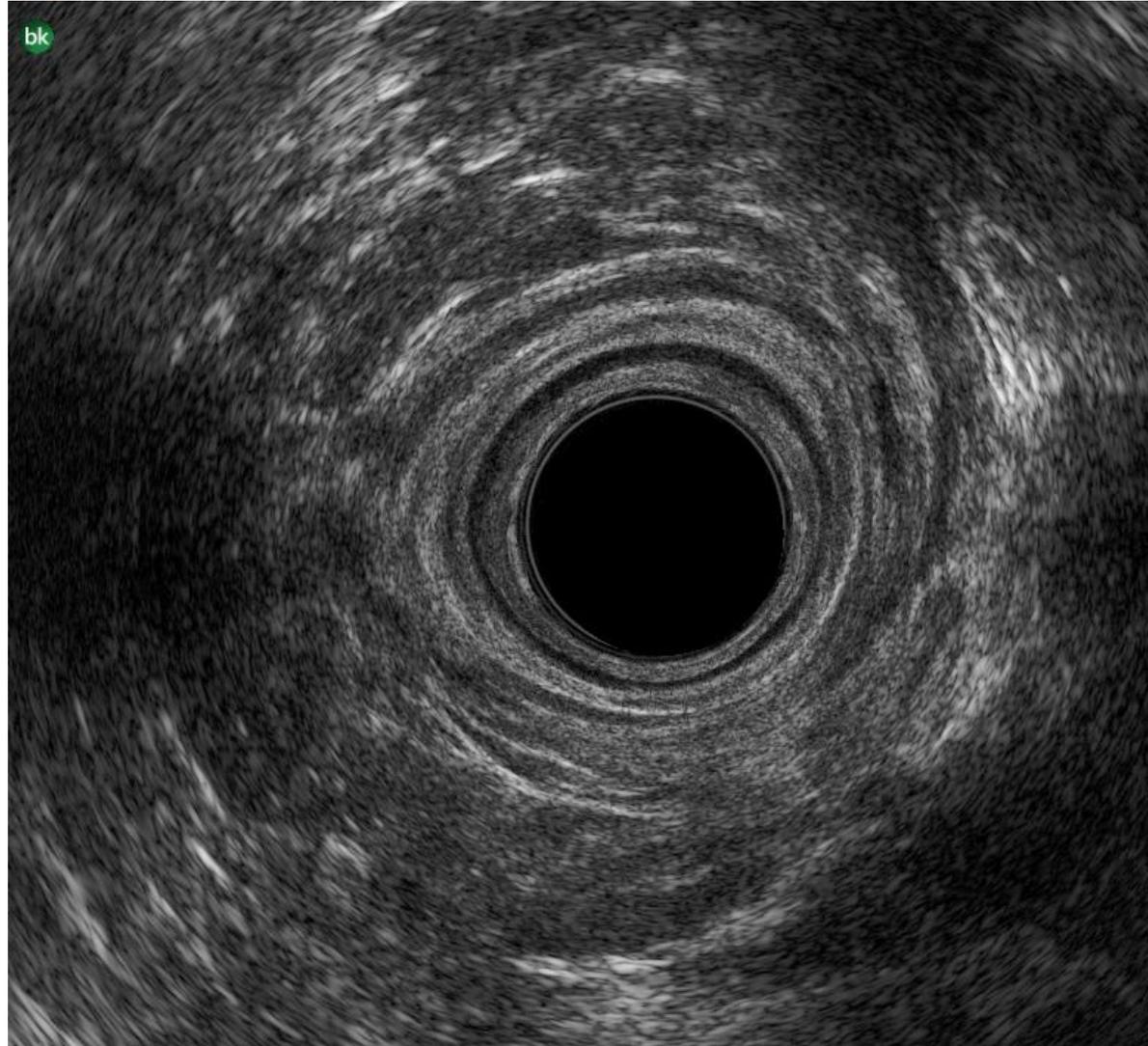
Mid anal canal



Distal anal canal

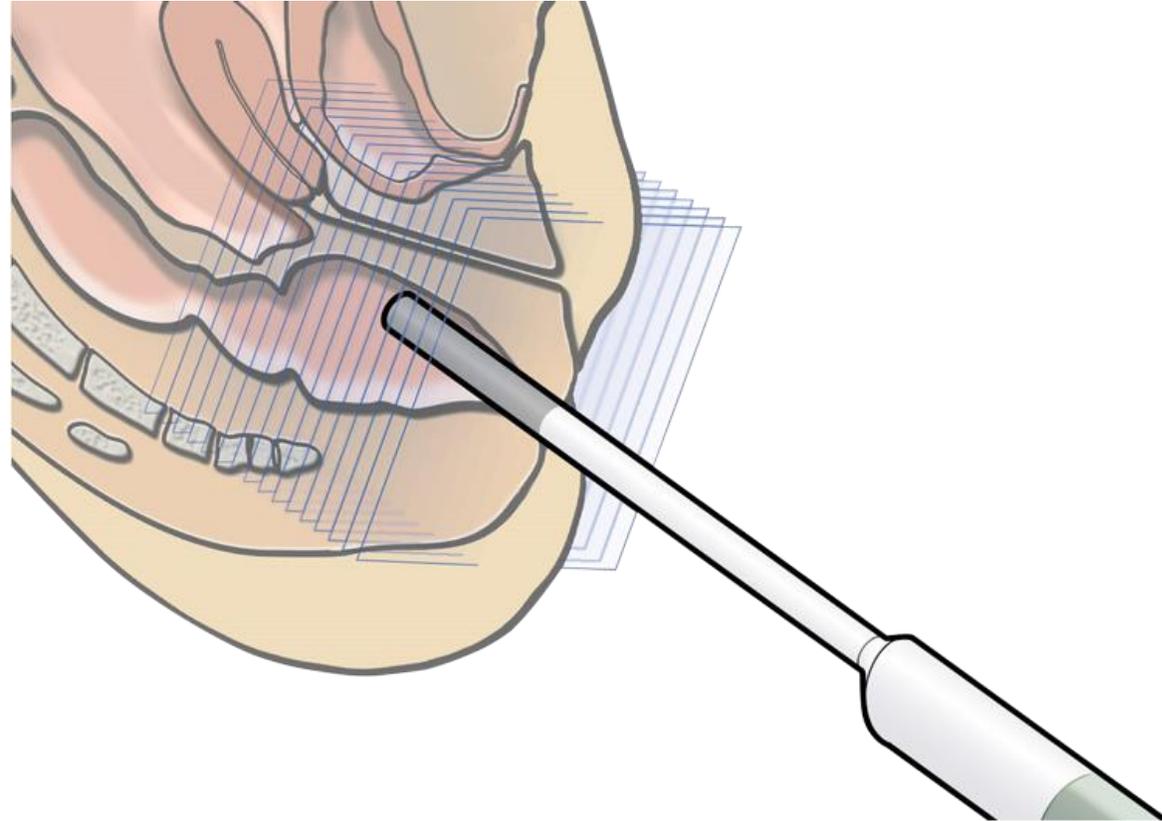


Anal Canal



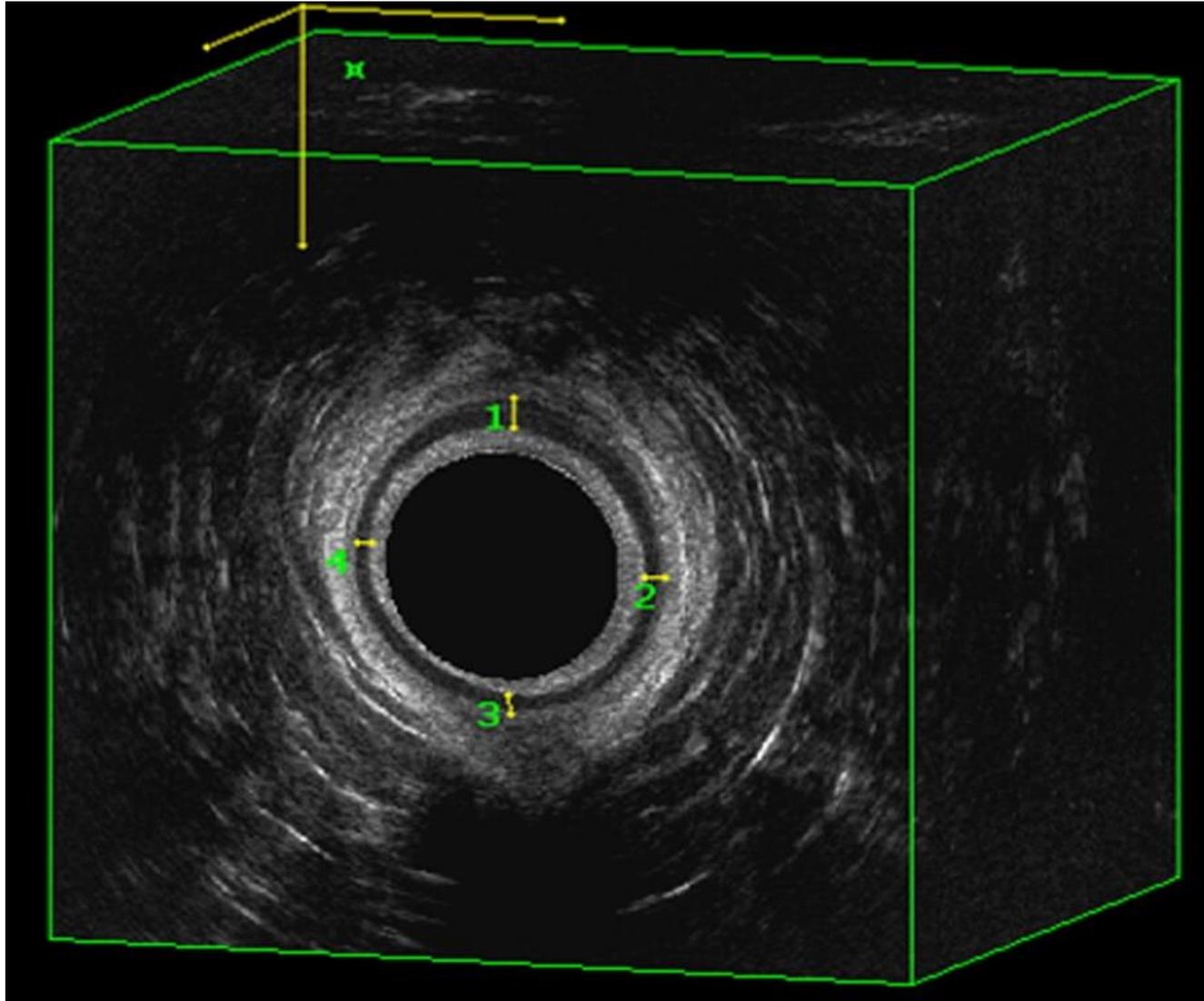
From upper
canal to distal
canal

3-D Image Reconstruction

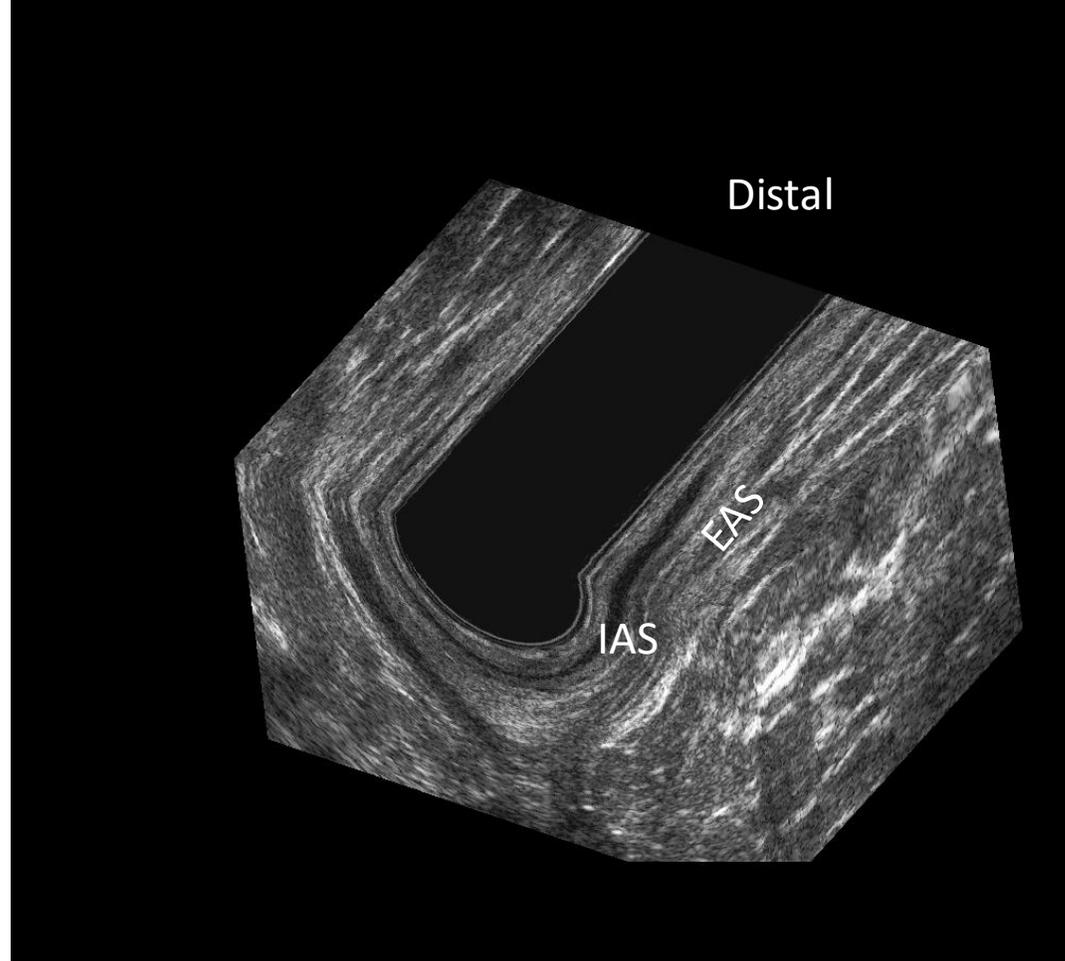


Endoanal: Posterior compartment (rectum and anal canal)

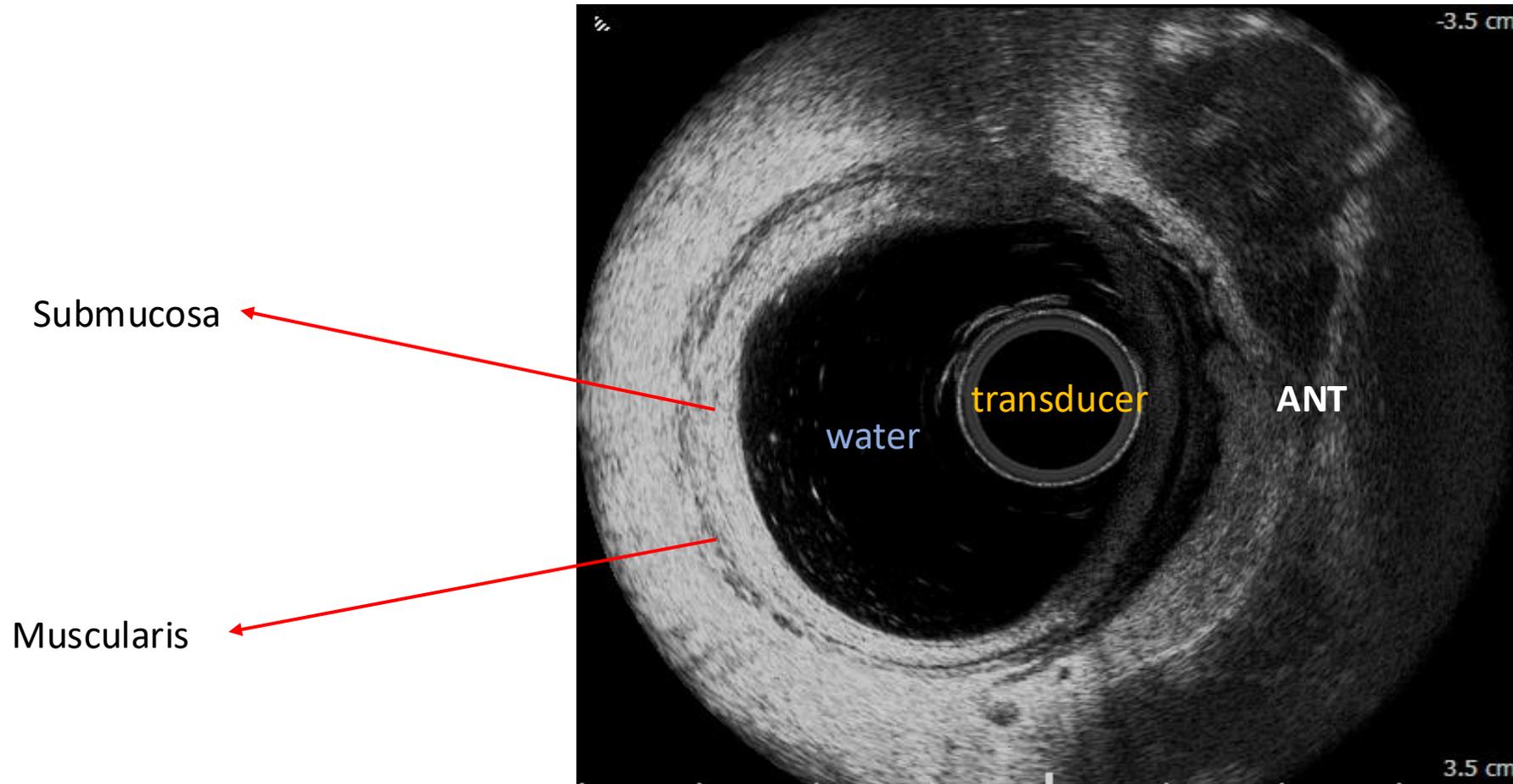
3-D Image Reconstruction



3-D reconstruction of the anal canal



The Rectum





Conclusion: **TPUS**

- Useful in perianal CD, UC and pouch
- BWT on TPUS predicts outcomes and correlates with indices
- Better tolerated than colonoscopy

Thank you!

Grazie!



Danke!

There are two kinds of fools.

One says, "This is old, therefore it is good"; the other says, "This is new therefore it is better."